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EDITORIAL NOTES.

British Gas Appliances for Home and Abroad.

APART from the actual operations in the vast areas of the European war, the feature of last week was the burst of interest and action in the matter of taking advantage of the enforced idleness of Germany and Austria in their export trade to develop that of the United Kingdom. The opportunity for this country and its manufacturers is, all the statistics show, a tremendous one; and, if there is present proper financial handling and provision, out of the present frightful international struggle, some great permanent benefit should accrue to the industries of this country, while the economic consequences to the countries with whom we are at war (especially to Germany) should be serious and difficult of retrieval. The Board of Trade and the Foreign Office have moved in the matter; and so have the Chambers of Commerce. British manufacturers are showing everywhere that they are keenly alive to the opportunities; and inquiries are being made broadcast into the situation from every industry. The country has to make up in some way for the ravages of war; it has to provide more employment; it has to find compensation for the cessation of the trade with Germany and Austria, which is not likely to attain high water-mark again immediately the war is over; quite certain it is, too, that Germany will not find the markets of this country welcoming her again, where it is found she can be dispensed with, with such open arms as heretofore. The eyes of the people have been opened. Energy is being displayed everywhere by manufacturers, by the people, and by the Press. The sword and gun are not the only means of international warfare; industry and commerce can also hit hard, and obtain enduring victories. America, it is noted, is showing great activity, realizing that there is advantage for her in the present position which she has had no hand in creating. Further, the opportunity has been given to study more closely than before the points where, in our industries, this country is not self-reliant; and through the sudden stoppage of materials from abroad, our manufacturers are applying themselves resourcefully to the discovery of how best they can internally meet not only now, but henceforth, their needs without having recourse to the countries responsible for the disturbance of the peace of the world.

However, opposing (we may hope only temporarily) all this activity and the immediate conduct of a large industrial and commercial campaign, there is one obstacle. The trade routes have been rendered safe by our Navy; and the State scheme of war risk insurance is good. But to effectually prosecute any considerable expansion of business with foreign countries and our own Dominions, cheap capital is wanted, and ready money is required for wages and other charges. There are the fundamental facilities and the will extant in the country; but there is the current financial stringency. Mr. D. Milne Watson, the Chairman of the Sulphate of Ammonia Association, in our "Correspondence" columns last week, referred to this, in showing cause for not engaging at the moment in the shipment abroad of sulphate of ammonia. He pointed out that, owing to the disorganization of present financial arrangements between this and other countries, no payments were being received for sulphate of ammonia shipped abroad; and bankers were refusing to make payments, even against letters of credit, for sulphate that might be shipped now. Bankers are very nervous; and the Government must do something if the gigantic export business that awaits this country in all directions is to be resumed and developed. Steps are being taken in the matter; but there is no fresh news to report at the moment. The sulphate of ammonia export trade is one line of business in which, given financial security, the gas industry and the cognate industries see an opportune time for gaining ground abroad. The point was dealt with last week; and there is an imperative necessity that, in regard to it, as little time as possible should be lost to this country, seeing that at home we only consume about 24 per cent. of our annual production, and Germany with her large output has now a substantial surplus—last year some 16 per cent.—and, what with new carbonizing plants there and the synthetic process of production, the surplus is likely, as time passes after the war, to proceed in enlargement at an accelerated rate.

Reference may also be again made to the question of Germany's export business in mantles. This business has ramifications practically all over the world; and at least 60 per cent. of the mantles required in this country are made in Germany. There are two immediate obstacles to the development of an export business from this country in mantles. The first is the fact that, excepting in small quantities, the practical monopoly of thorium nitrate production is centred in Germany. It would seem that our best hope of escape from this would be by the British Government taking steps to secure for the British Empire rights in the Travancore (India) deposits of monazite sands—the present anomalous position being that mantles made by the nitrate of thorium produced from that rich Indian sand only find their way to this country *viâ* the German Auer Company—just as Germany has secured a virtual monopoly in the principal materials required for the making of the metallic filaments of incandescent electric lamps. Germany has been cute in this matter of incandescent gas-mantles; and it has had a rich reward. But it is time that something more was done in this country. The other obstacle is that Germany's export business in mantles is a tremendous thing; the mantles required in this country alone would need the provision of very large extensions of premises and plant on the part of our own home makers. This could not be done in a day; and British makers would need, before committing themselves to any such extensions, the assurance that, after the war, the gas undertakings and retailers of mantles would not return to German productions. But it must never be again that the consumption of mantles by the British gas industry finds a larger patronage of German factories than of British ones. If greater British patronage of British-made mantles follows the present awakening of the gas industry of the United Kingdom to the peril of its reliance upon Germany, it must see to it that not only nitrate of thorium is produced in this country from Indian sands, but that other materials required for mantle making are made here in sufficient quantities. At the moment to the best of our belief there is only one ramie-producing firm in this country; and it has not had a great deal of support. It is said (we cannot vouch for this from practical experience) that the huge German ramie works at Emmendingen have, through cheapness and merit, got the run of the business. We can understand cheapness accompanying quantity of output; but we fail to see why in quality merit should be the monopoly of a German factory. However, if the British mantle makers were supported so that they could take up the work of supplying the British market, there is not one of the wholesale or retail firms who have been in business in the mantle trade in this country that need put up their shutters. They could still act as distributing agents—but for British-made goods. There is an opportunity here, if pressure is brought to bear in regard to thorium nitrate, concerning which a communication appears from Mr. Charles Carpenter, D.Sc., on p. 445. Particular attention is asked to the final passage of this communication.

Passing along, the German export trade to several parts of the world includes gas meters and fittings. There, again, there should be a good opportunity for firms that are an integral part of the British gas industry. It is probable, too, that this country will come largely into its own in connection with the aniline dye business, in which the gas industry is concerned as tar producers. The makers in this country are working hard to secure a greater share of the business. Mr. Ivan Levinstein, of Levinsteins Limited, reports that orders for dyes are now coming to this country from America and Italy at such a rate that his firm are working day and night in the effort to keep pace with the demands on their resources. Some of our own firms in the textile industries are already reducing their outputs

and staffs owing to the shortage of aniline dyes; and these home establishments ought to be first served with home production. The British aniline dye producers and others concerned in the chemical industries would like to see the (to all intents and purposes) monopoly of Germany in this direction destroyed; but it will be impossible—and this is being impressed in the proper quarter—to effectually do this unless the Government come to the assistance of the makers. While the German Government have been encouraging the chemical industries, our own authorities have not made a counter move. Alcohol, for instance, is an essential in the manufacture of aniline dyes; and the German manufacturer can buy it at one-twentieth the price that the British manufacturer has to pay, owing to the high duty charge. The question is being asked why the British Government cannot remove the duty on alcohol used in the chemical industries; but the answer has not yet been given. Just two or three figures to show the vastness of Germany's trade connected with aniline dyes. The British Consul-General for the Westphalian and Rhenish Provinces, in his report for 1913, stated that the export of aniline colours that year totalled to £7,100,000. British imports of aniline stuffs from Germany last year amounted to £1,800,000; and at the present time in this country we only produce somewhere about £500,000 worth of these dyes. The figures are significant.

Such a golden chance has never been afforded British manufacturers as now while the gates of Germany are effectually locked. The initial difficulty of our British manufacturers is one of finance, and only the Government can pave the way in this regard. The manufacturers also require patriotism to ensure their support after the war. Given the monetary facility and honest assurance, all will be well. But there is one thing against which there should be warning, and that is the senseless boycotting of firms conducted under German titles. There are large firms in our midst carried on by men who have been good citizens, have cultivated their businesses with integrity, have contributed their share of rates and taxes to this country, and have traded considerably in British made goods. Some of them have their own producing works in this country; and their enterprise has helped to create employment here. After the present trouble is happily over, the trading and development of such firms will be more and more with British manufactured goods. Let it not be forgotten that there is a contra account. In Germany, there has been a considerable investment of British capital.

Gas-Works Colliers in Times of War.

THE British nation is not frequently at war, and still less frequently has it to put its difference to the arbitrament of the sword and of naval power. But it is so now; and the occasion has supplied a test of the value to gas-works using sea-borne coal (and of sufficient size) of having their own vessels for its conveyance. Their economic value has been demonstrated in times of peace; for such gas-works are not subjected to freightage vagaries and delays that sometimes accompany the hiring of colliers. But the most crucial test of value is on an occasion like the present. Thanks to administrative prevision, the London works are all well coal-stocked; and thanks to the British Navy, and the clearing away of exotic mines, colliers can pass, and some have done so from within a few days of the declaration of war, without much trouble or much danger, from the North to southern gas-works favoured by being on the sea-board or with other water-way. But there is a difference at the present time between those concerns with their own colliers, and some of those who have to rely upon deliveries by contract or hired boats. The former are now able to obtain and to supplement their stocks as fast as their vessels can run to the North and back again. Those relying on contract transport are not all in such a happy position, though a trip along the Thames has shown that certain works with reliable contractors have had marshalled at their wharves an unusual display of well-laden barges. But some of the more remote works on the southern coast have not been so fortunate, nor have certain works that depend partly on sea transport and partly (from boat to works) on rail. But most of them have good stocks. Those that have not are the victims of mismanagement or unreliable contractors—if mismanagement, after the lesson of the national coal strike, then we have no sympathy for them.

In reply to a question at the Wandsworth, Wimbledon, and Epsom Gas Company's meeting on Tuesday last, the Chairman (Mr. H. E. Jones) referred to the fact that the Company were in a better position than ever in regard to coal stocks; and he attributed this to the possession of their own colliers, which has enabled them to keep the works better served than is the experience of some works that contract for transport, or that have to hire through their own boats being commandeered. The commandeering is a danger that, in time of war, besets private ownership. For example, the Gas Light and Coke Company's large collier *Fulgens* is in the service of the country to-day, and not in that of the Company. The Commercial Gas Company have their own boats, and they, too, are feeling the good effect of possession, as was intimated by the Chairman (Mr. W. G. Bradshaw) at the recent meeting of the proprietors. Of course, the contracting owners of colliers have had boats chartered by the Admiralty; but Mr. Jones at the Wandsworth Company's meeting had a few caustic words to say anent those owners who had voluntarily thrown over gas companies' contracts owing to the attraction of higher rates in other quarters. Some companies are suffering from this. Yet inquiries up North show that there is a large amount of coal accumulating at the pit mouth; and through this, and the freedom of the railway lines between the pits and the wharves, colliers are able to get loaded practically within a tide. The result is that some colliers are able to make about seven trips to London within a month, instead of (say) five; and, in consequence, those works with their own boats have actually more coal in hand to-day than they had before the war began. At any rate, the number of trips that it is reported from the North the private boats have made compared with normal times, enable the statement that this is so to be made with some confidence. Railway transit for coal has been partially interrupted through the requirements of the War Office and (in less degree) those of the Admiralty; but the conditions are not far from normal to-day. Speaking of railways, at both the Commercial and the Wandsworth meetings, something was heard about the Companies' stations away from water-ways being cheaply fed with sea-borne coal from the receiving works by the Companies' motor lorries. The advantage of gas undertakings in like position being self-contained has been proved by these concerns to be an economic advantage in ordinary times, and an inestimable advantage during a European war.

The Legality of a Humane Duty.

THE question has been raised, and we hope every gas administration in the country will promptly bundle it on one side, as to the legality of contributions made to national relief funds by statutory gas undertakings whose financial position has certain limitations imposed by the rights of the consumers. It is not the time, under the circumstances in which the country is so deeply involved, and the issues of which are bound to be terrible, for any stupid sentimentality regarding the legality of doing all that is reasonable in contributing to the national provision for meeting what we know is before us, as well as we know that night follows the day. The conscience of everyone must tell him and her that duty is to-day the supreme thing, and that no Britisher will dare now or hereafter to question the legality of any contribution that is made in the name of all that is humane from the funds, and whatever the fund, of any gas undertaking. Such a person would be hooted out of the place wherever he ventured to make his protest against the payment. But for the interest of those Directors who would like to make contribution, but are afraid—we do not believe there are many such—of the chimerical consequences, they will be interested to learn what two lawyers—Mr. George Ennis and Mr. A. M. Paddon—think of the matter.

Mr. H. E. Jones, speaking at the Wandsworth, Wimbledon, and Epsom Gas Company's meeting, said he earnestly thought that every individual and company should put a "shoulder to the wheel" and help to fortify the country and its poor people against privation and assist in the alleviation of suffering. He proceeded to suggest that, in order that there should not be any question as to the legality of their action, the proprietors should be called together again to vote a sum from the reserve fund. The proprietors present did not appear to be very anxious to be called together specially for the purpose; and they gave a very hearty endorsement to the remarks of Mr. Ennis, when he said the matter could very well be left in the hands of the Directors—adding that, though there might be [he did not say there would be] a little irregularity in dealing with the funds of

the Company, the lawyers had a saying that "subsequent "ratification is as good as antecedent authority." Then Mr. Paddon, at the Lea Bridge Gas Company's meeting, spoke as follows: "Nobody would stop to consider whether "it [a contribution] came within the strict legal powers of "the Company, though he was confident that it did. Under "the general enabling powers of the Incorporating Acts, "the Board would be perfectly justified in taking this action "in the interests of the Company; but there was no need "to look at it from this point of view." And so think all Britishers, other than those whose parsimony goes to the extent of inducing them to take the contemptible course of hiding behind the excuse of an illegality which they know full well nobody would raise, and, if anybody did raise it, he would be ignominiously kicked out of court, and branded for precisely what he was. Several gas undertakings have already subscribed; several have announced their intention to subscribe; and we hope all will do a part. "England "expects that every man will this day do his duty."

Sulphate of Ammonia Production, and Oxide Investigations.

Official "penalty hunters" do more harm than good to the service to which they belong; for, where they exist, hostility always occupies the place that should be filled by co-operation. We cannot, of course, for many reasons, go along in the ordinary manufacturing routine of the country without official inspectors; for it is a fact that, without them and their supervision, there would be a great deal of negligence in and nuisance from works, and unhealthy conditions of occupation, throughout the land, owing to a proportion of manufacturers who are callous to all else than profit-making. Inspectors have a safeguarding duty to perform. They are like the British Fleet; their presence, and a knowledge of the power that lies behind, or reposes in them, are a sufficient deterrent. Inspectors, too, from the extensive field of their observations and their opportunities to gain information, can be advisory, and so very helpful. When reading the annual report of the Chief Inspector under the Alkali Works Regulation Act (Mr. W. S. Curphey) and of his district inspectors, we see that he and they are still carrying on the traditions of the department that were so well and effectually followed in the days of Mr. R. Forbes Carpenter. In a single sentence in the report before us (from which extracts were published last week and again this week), there is what to our mind is one of the best possible pieces of testimony as to the efficiency with which the work of the department is conducted. It says that "no case arose during the year in "which proceedings were entered for the recovery of penalty "for infraction of the provisions of the Act as regards undue "escape of acid gases, or for failure to use the best prac-"ticable means for the prevention of the escape of noxious "or offensive gases." This shows the confidence of the manufacturers in the inspectors, as well as the desire on the part of the former to so improve plant and to introduce new and more perfect methods, to the end that work is conducted in the best known ways, with freedom from offence. The method of the inspectors is to realize the objects of their office by peaceful persuasion and helpful means rather than by an antagonizing system, under which an inspector in other walks is sometimes looked upon in the nature of *persona ingrata*.

The section of the report that deals with sulphate of ammonia manufacture is again of very considerable interest. There is no question that Mr. Curphey and his assistants in the various districts of the country are having, and will continue to have, considerable influence in producing improvements to prevent the waste of ammonia, through leakages and bad working, that has been all too prevalent in gas-works, and in raising the productive results per ton of coal carbonized. The Chief Inspector finds there is a decided tendency in the direction of realizing larger productions per ton; and this is attributed to three conditions—to saving of former leakages, to improved methods of coal carbonization (which do not have the same destructive effect on the ammonia as when carbonization in gas-works was conducted with light charges and much free space in the retorts), and to the extended adoption of the direct method of working. Regarding the direct method of production, the Chief Inspector states that this was brought into further service during the year both at coke-ovens and in gas-works. Except in certain of the smaller works, we do not know of many adoptions in gas-works at the present time, save as trial installations; but the application of the system appears to be surely coming, as, excluding some minor surmountable difficulties, very satisfactory experiences are being realized, about which in due season we shall hear more. Reverting to the question of loss of ammonia by leakage or indifferent working, this is a matter that is treated upon by Mr. A. C. Fryer, the Inspector for the South and South-West of England, who also alludes to the importance of maintaining the quality of the material [*ante*, p. 391], and seeing that it is properly dried, and its acidity low.

The useful figures that Mr. Curphey includes in his report as to the production of sulphate of ammonia act as a check upon those prompt gaugings that are made of production during the preceding twelve months by Messrs. Bradbury and Hirsch right at the commencement of each year. On this occasion we see that there is a difference of some 12,000 tons between the estimates of last January and the figures now before us, as derived from returns—the total production of the United Kingdom having been given in the estimate of the firm named as 420,000 tons, and now by the Chief Inspector as 432,618 tons. The difference between the two figures raises from about 32,000 tons to 44,310 tons the increase in the production of sulphate of ammonia in 1913, as compared with 1912 (the coal strike year), or an advance not far short of 50,000 tons, compared with 1911. Gas-works last year, in making a contribution of 182,180 tons to the total, showed an increase of 10,086 tons, while coke and other carbonizing plants (apart from those at iron and shale works) contributed, by their output of 167,421 tons, upwards of 30,000 tons more than during 1912 and 1911. These are significant figures. But we doubt very much whether this rate of increase will be shown again this year. Last year, the gas industry considerably curtailed its production of carburetted water gas; and this was largely responsible for its advance in sulphate production. But carburetted water-gas manufacture has, with lower priced oil obtaining, been restored to its former place in gas production work, and so a somewhat smaller quantity of coal will be carbonized this year, resulting in a lower make of sulphate of ammonia. In the case of coke-oven plants, there is also likely to be curtailment, inasmuch as the ebb in trade has reduced the demand for metallurgical coke, and now the war is having further effect in lowering and retarding business. Before the war, the stocks of hard coke were assuming portentous dimensions; so that there may now be some considerable letting-down of ovens, and so a lessening of activity in sulphate of ammonia output. At the same time, it is known that coke-oven owners have in several directions extended their bye-product recovery plants, and have put down altogether new ones; and this accounts for the considerable addition to sulphate production in 1913.

A further instructive part of the report is that in which Mr. S. E. Linder, B.Sc., pursues the narrative of the results of his studies during the past three years into the behaviour of oxide during fouling and revivification operations in sulphate of ammonia works. The investigation was originally taken in hand with the object of determining the conditions that favour the souring of oxide; but it proved to be, as readers are aware, an intricate problem, and many side-issues presented themselves for research. Among other matters taken in hand has been the exploration of the question of the "efficiency" of an oxide—"efficiency" being defined as the maximum volume of sulphuretted hydrogen, measured at 0° C. and 760 mm., that a given weight of oxide is capable of absorbing, calculated per hundred volumes of sulphuretted hydrogen absorbed by an equal weight of pure ferric hydrate, $Fe_2O_3H_2O$, under similar conditions. The standard method originally adopted for determining efficiency required the use of a suitably moistened air-dried oxide; comparison being made with a sample of pure hydrated oxide similarly prepared. Mr. Linder, however, points out that comparison might equally well have been made between test and standard samples of oxide both dried at 100° C., and subsequently remoistened, or both dried at 100° C., and used dry for sulphiding. Part of the work now reported upon is an attempt to decide which one of three methods is the best. Typical samples of bog ore were exhaustively sulphided, and the results compared with those obtained by the sulphiding of pure hydrated oxide under the same conditions. The issue is found in tables which appear in the report [will be abstracted later], which tables show that oxide dried in an air-oven at 100° C. until the weight is constant, and then remoistened—the moisture content being adjusted to 15 to 20 per cent. by the addition of water—

is in the best condition for the absorption of sulphuretted hydrogen. In the experiments the amount of absorption at the end of the first day and at each subsequent period was in every case greatest when oxide was used under these conditions. In other parts of the report, we get emphasized the intimate relationship that exists between the degree of hydration of an oxide, and its efficiency as an absorbent of sulphuretted hydrogen. It is shown by the analysis of revivification products that, with a low degree of hydration, there is a marked increase in the amount of disulphide formed, and subsequently of its oxidation product—ferrous sulphate. If the efficiency of an oxide is to be maintained, a fine degree of hydration is of the first importance; but Mr. Linder fears that the hydration condition of the oxide employed at many sulphate of ammonia works is by no means so carefully safeguarded as is desirable.

The report also discusses the questions of the presence of ammonia in saturator gases with special reference to the prevention of the souring of the oxide, of the temperature attained by oxide purifiers in English and Scottish practice during the sulphiding and revivification process, and of the cause of the souring of oxide in Scottish works. This section, which makes an excellent contribution to the technical literature on purification problems, winds up with an account of laboratory experiments by Mr. H. J. Bailey on the fouling of oxide of iron. Space here will not permit of the further pointing of the results of these inquiries; but what has been said will, we are confident, be sufficient to turn many of our gas chemists to a critical examination of these results.

A Considered Opinion on Experts

In the report of the proceedings at the meeting of the Lea Bridge Gas Company, there will be found the considered opinion of Mr. A. M. Paddon on two points of interest to our professional readers. In the first place, it will be observed that Mr. Paddon's experience at the Parliamentary Bar has not increased his respect for expert witnesses. Speaking of the total charge in the accounts of gas undertakings for maintenance, repairs, and renewals, he said that he had often in Parliamentary Committee rooms heard experts give evidence, of which they ought to have been perfectly ashamed, that something like 8d. per 1000 cubic feet was ample for this purpose. In the same connection, he said that the proprietors knew how expert witnesses had been characterized; and he was sorry to say, from his experience of them, that they deserved most of the hard things said. This is rather a sweeping and comprehensive assertion; and some exceptions might have been made. We wonder what Mr. Paddon's directorial colleague Mr. A. F. Phillips, his new Brighton and Hove colleague Mr. Frank Jones, and Mr. Joseph Cash think of the considered opinion of their Chairman, who, at the Parliamentary Bar, has at times to deal with them as friendly or (it may on occasion happen) hostile experts.

And One on the Calorific Standard.

There was also a pronouncement by Mr. Paddon on the course of gas legislation during the current (and now interrupted) session of Parliament, which pronouncement embraced certain allegations without a tittle of evidence given in support. This is good legal strategy until one gets before a competent court; and so Mr. Paddon may be invited to come out into the open, and show the nature of the ground that he has to support his statements, which as they stand are, to say the least, somewhat bald. "The course of legislation in gas affairs during the past session," he said, "had been absolutely disastrous." Why? "He had never known a session in which there had been so much legislation passed detrimental and derogatory to the gas industry." Which parts of the legislative doings of the session are referred to as having been "detrimental and derogatory"? "The calorific standard had been most unfortunate." In what specific way? "Instead of lightening the burdens of gas companies, it had materially added to them." In what way, and by how much? "He was personally very doubtful whether the new calorific regulations could be met without a definite amount of added loss." Why? "It was a fatal campaign, which never ought to have been started or persisted in." Why? We will not follow Mr. Paddon any further; but will ask him, now that he has stated his beliefs so tersely in regard to modern legislation, to supply his reasons for holding them. In regard to every one of them, he left off just where the greatest interest would have come in. Our questions may look something like an examination paper; but it is Mr. Paddon's business when witnesses make very general assertions to get at the root of them. Perhaps for the common good he will not for once mind reversing his position. We are sure that the colossal amount of professional intelligence which believes in the calorific standard will be vastly interested in learning from Mr. Paddon where, in his view, the intelligence has gone so lamentably astray.

A German Coke Organization.

We have lately been drawing attention to the necessity, and the utility, of the Sulphate of Ammonia Association, recently formed, and its Selling Committee. In the "JOURNAL" for Aug. 11, there was reviewed a handbook, by Dr. Schilling and Dr. Bunte, on the "Organization and Administration of Gas-Works;" and, in the course of the review, there were a few lines alluding to the systematic sale of coke in Germany, which should have interest at the present time to our home readers, in view of the condition of the home coke market. In Germany they have an Industrial Union of Gas-Works, with headquarters at Cologne, a branch in Berlin, and an export office in Hamburg. This Union takes cognizance of the coke supply throughout the country; and any gas undertaking having a surplus which cannot be disposed of to advantage in its own district is informed of the best market, having regard to prevailing prices and freights for the excess. As the reviewer pointed out, in this way suicidal competition is avoided, and even the smaller gas-works have their interests well protected. There is a suggestion here that might be, at any rate, worth looking into. At the meetings of the Gas Light and Coke Company and the Tottenham Company, Sir Corbet Woodall (as reported on the 11th inst.) had something to say concerning the coke situation; and at the meeting of the Commercial Gas Company, information was supplied as to the steps that have been taken to create a larger home demand. These steps have (as the report of the proceedings showed) been rewarded with success.

Tempting the Earlier Fixing of Fires and Cookers.

Mr. Charles Hussey, the Chairman of the Croydon Gas Company, stated at the meeting of the proprietors last Friday, that they had last half year a greater increase in the number of gas-fires let on hire than had been experienced during any preceding June half year. The June half is not one, except at the beginning, in which it is usual to look for a big increase in the number of gas-fires connected. The abnormal condition last half year is due to the efforts of the Company in trying to spread the orders for fires and cookers more evenly over the year, in order to avoid as far as possible seasonal rush, and the delay that must inevitably arise with the piling-in of orders in a short space of time. What the Company are doing to encourage orders for gas-fires out of the season is by offering not to commence the charge for rent for those fixed after the beginning of March until the October-December quarter. The good experience of this system has led to its extension to cookers; all cookers now fixed after Aug. 1 are rent-free until March 31. Thereafter, the annual rentals are payable quarterly as usual. In another company no rentals are charged during the summer months for gas-fires; and fires ordered during these months are fixed free. In this case, the idea is to prevent the return of the fires during the summer months—a method adopted by some consumers with the view of escaping the payment of two quarters' rent for them. The disadvantage of the system is that the rent is heavier for the two winter quarters than if split up between the four quarters—the result being that the heavier rent falls on the two quarters during which the consumption of gas is the greatest. The heavier rentals help to swell the total of the bill.

Tests of the Thomas Electric Meter.

In the course of the Inaugural Address of Mr. Edward Allen at the last meeting of the Institution of Gas Engineers, he referred to the working of the Thomas electric meter at the Linacre Gas-Works, Liverpool. This meter is known and has been tested at several places in America, but that at Linacre is the only one working in this country; and, according to Mr. Allen, it is doing so very satisfactorily. Some trouble was experienced with it at first; but the cause was removed, and the meter was regarded as

likely to be "a useful and reliable instrument." At all events, it showed itself capable of passing 750,000 cubic feet of gas per hour, while the capacity of one occupying seven times the space was only 175,000 cubic feet per hour. This is an exceedingly good record. Readers who desire information in regard to this meter may be referred to an illustrated description of it which appeared in the "JOURNAL" for Jan. 21, 1913 (p. 186), in some extracts from a paper read by the inventor—Professor C. C. Thomas, of Wisconsin—before the American Gas Institute. Particulars of some interesting tests carried out at one of the stations of the Detroit Gas-Works, extracted from a paper read by Mr. J. C. Wilson at the last meeting of the Wisconsin Gas Association, will be found elsewhere. It is claimed for the meter that it gives results in standard units of gas at 30 in. and 60° Fahr. saturated, irrespective of the temperature or pressure of the gas flowing through it, that its registrations are accurate through a very wide range in the rate of flow, and that variations are traced on a graphic chart, so that periodical inspection to check features which may affect accuracy are rendered unnecessary. The meter is constructed upon a principle which Mr. Allen thinks bids fair to "revolutionize the present method of measuring gas;" and therefore the attention of readers may be usefully directed to it.

AN ENGLISHMAN IN GERMANY.

Mr. Hutchence's Experiences.

IT is with satisfaction we are able to announce that Mr. Ernest J. Hutchence, whose detention at Bentheim was notified in our columns last week, has been able to reach England, and called at the "JOURNAL" Offices on Tuesday to report himself as safe. Mr. Hutchence has since forwarded the following "Diary of Events" connected with his experience, which will be read with interest.

Aug. 6.—I had been Acting Vice-Consul for five weeks. This morning two policemen called upon me, and on behalf of the "Home Minister" strongly advised me to leave Hanover. I procured the necessary pass from the military authorities, and took the midday train to the Dutch border. I had no time to pack, so have only the clothes I stand up in. The journey took eighteen hours, instead of four as usual. It was like a nightmare of howling, shouting soldiers and civilians, all drunk with the lust of war. Every carriage had remarks on it about us and our allies. Fortunately I escaped detection.

At Bentheim, on Friday morning, I was held-up; and when I referred to my special pass, they bluntly informed me that all Englishmen were to be arrested, pass or no pass. I was taken to the local prison, where everything on me was taken away; and I was locked in a cell of 700 cubic feet capacity. There was a flock bed with blanket, a table, a bench, and a locker; and the sanitary arrangements consisted of a pail in the corner. Here I remained alone until the Monday (three days), and only got out once for half-an-hour. The food was coffee and dry bread in the morning, soup for dinner, coffee and dry bread in the evening.

On Monday, Aug. 10, I was allowed to associate with other English prisoners, Mr. Drummond Hay, of Danzig, and his party. We were permitted to cater for ourselves, and could sit in the prison yard and play games all day. At night we were locked up again. The only criminals in the prison were a youth who had stolen, and a man who had smuggled (and been found out).

On Friday, Aug. 13, I was given the option of going to the hotel, where were forty prisoners of war. The arrangements were primitive; but the expenses amounted to only about 3s. 6d. a day. I stopped here until Saturday, when I was released, and conveyed to the border, in virtue of my office.

Nobody insulted me in any way whatever. The "Landrat's" (Lord-Lieutenant's) wife searched the village for us for games. The warders were absolutely honest; and when I left I had to promise to let them know if ever I passed through Bentheim again. As a memento of my stay, one of them presented me with two picture postcards.

The trying part of it all consisted of the suspense and the solitary confinement.

Postponement of the Glasgow Gas Exhibition.

We are informed by Mr. James M. Freer, the Manager of the Glasgow Corporation Gas Exhibition, that the Committee in connection therewith have decided to postpone the enterprise until a more suitable date. The Committee felt that the present unsettled condition of the country would prevent the exhibition being the great success which had been anticipated; and they therefore considered that they had no option but to take the step now announced. Mr. Freer states that all the exhibitors already booked have whole-heartedly supported the decision of the Committee. It will be remembered that the exhibition was to be open from Sept. 23 to Oct. 17.

THE GAS INDUSTRY AND THE WAR.

It was stated in this column last week that a letter had been sent by the Secretary (Mr. W. T. Dunn), by direction of the President of the Institution of Gas Engineers (Mr. John Bond), to Lord Kitchener, calling attention to the necessity of arrangements being made for safeguarding and regularly maintaining the inwards and outwards traffic of gas-works throughout the United Kingdom, including the supply of coal and all other material, and the disposal of all residual products. The letter pointed out that it was urgently necessary that the supply of gas should be amply maintained, and expressed the hope that the War Office might issue an order exempting horses and all motor vehicles belonging to gas undertakings from being requisitioned during the war, and also that adequate provision would be made for suitably guarding gas-works, so that the gas supply might not be jeopardized—otherwise public panic was likely to ensue. To this communication, the following reply has been received, signed by Major W. Nathan Cox, for the Director of Remounts: "I am directed to inform you that instructions have been issued that every consideration is to be shown to owners regarding impressment of horses; and at present in no case are more than 50 per cent. to be taken. I am to add that it is impossible to say what the Government demands in the future may be."

The Belgian Minister in London has opened a fund (under the patronage of her Royal Highness the Duchess de Vendome, sister of his Majesty the King of the Belgians) to relieve the distressed families of the Belgian soldiers now in the field, who are gallantly defending their country against an unprovoked attack, and to afford help to the sick and wounded. In making this appeal to the British public, the Belgian Minister feels sure he can count upon their sympathy in Belgium's hour of need. Contributions to this excellent cause may be sent to the Belgian Legation, No. 15, West Halkin Street, S.W., or to Louis Godchaux, the President of the Belgian Chamber of Commerce in London, No. 155, Fenchurch Street, E.C., marked "Belgian Relief Fund."

In connection with the reports of the over-running of North Belgium by the German Army, it was gratifying to note in the "Evening Standard" on Saturday that the New Inverted Incandescent Gas-Lamp Company, Limited, of Farringdon Avenue, E.C., had received the following telegram from their Manager at Ghent, timed 9.3 that morning: "Factory continuing manufacture. All well." On inquiry of Mr. J. Bridger, the Managing-Director, yesterday (Monday) morning, he stated that in a letter sent off to him from Ghent on Saturday there was no mention of the Germans being in occupation; and he stated, as a further gratifying fact, that he had safely received from the works some goods which were dispatched on Friday.

Mr. Edward Howell, the Secretary and Manager of the Yeovil Gas-Works, and his two daughters were going to Switzerland for their holiday, and wishing to travel *via* Genoa took passage by the North German Lloyd vessel *Bulow*. After a stay in Lisbon of a day, they proceeded to sea, and when they had nearly reached Gibraltar the Captain suddenly turned the boat round, and inquiries for the reason brought to light the fact that war had been declared against Germany. The Captain's instructions were to run for the first neutral port, which was Lisbon; and this was safely reached. The party at once asked as to the best means of getting back home. A railway journey was impossible; but they heard that the R.M.S.P. Company's ship *Alcantura*, running from Brazil to Southampton, was due to call, and secured a passage in it, leaving on Aug. 5. The vessel steamed with lights out at night. Through the Bay of Biscay and in the English Channel the vessel was stopped by no less than five English and French war vessels. On the trip home, though the party were anxious to communicate with friends, the Captain politely refused to send wireless messages, as such a course would be liable to disclose the position of the ship to the enemy. At Start Point the Captain was informed that, owing to Southampton being so heavily mined, it was dangerous for large ships to put in; and orders were given for him to proceed to Liverpool. Compared with the experiences of other Continental travellers recently, the party were fortunate; for beyond some anxiety as to getting back from Lisbon, and some suspense as to the nationality of the warships which brought up the *Alcantura*, they spent a pleasant time, though their holiday was curtailed.

The following further subscriptions have been noted in the "Daily Telegraph" list of contributions to the Prince of Wales's Fund: Brunner, Mond, and Co., Limited (further contribution), £3000; Stewarts and Lloyds, Limited, £3000; Anthony Gibbs and Sons, £1000; Gas Light and Coke Company, £1000; Pease and Partners, Limited, £1000; Redpath, Brown, and Co., £1000; Brighton and Hove General Gas Company, £525; Curtis's and Harvey, Limited, £525; Carless, Capel, and Leonard, £500; Newton, Chambers, and Co., Limited, £500; Richmond Gas Stove and Meter Company, Limited, £500; Lea Bridge District Gas Company, £315; Hornsey Gas Company, £250. The Croydon Gas Company have agreed to give £250.

Speaking at the meeting of the Brighton and Hove General Gas Company last Friday, Mr. A. M. Paddon referred at some length to the generally disturbed conditions existing. The Company's

coal is sea-borne; and an arrangement has been entered into with the contractors for three months, under which it will cost something like 1s. 6d. per ton extra to get the coal. More than one hundred of the men have been called up in one way or another to serve their country; and adequate arrangements have been made by the Directors for the families left behind, as well as for protecting the positions of the men who have gone away. The proprietors present at the meeting indicated in an unmistakable manner their approval of the steps taken by the Board in this matter, and also of the contribution of 500 guineas to the Prince of Wales's Fund. This sum the Chairman intimated was to come out of the general funds of the Company.

The associated firms of Thomas Glover and Co., Limited, and R. & A. Main, Limited, have had between 50 and 60 of their employees in the various branches called out—headed by Captain W. R. Glover and Captain R. B. G. Glover, of the First City of London Royal Fusiliers. The firm are, of course, making provision on the usual scale for the wives and families of those who have been called out, and are keeping open the places of those on service until they return. Their whole resources—including their fleet of nine heavy motor lorries, two light lorries, and all cars belonging to the principals of the firm—have been placed at the disposal of the authorities as required.

The steps that are being taken by the Lea Bridge District Gas Company in connection with the war were detailed by Mr. A. M. Paddon at the meeting last Tuesday. A number of men have gone to join the Colours; and provision is being made for the wives and children left behind, as well as for the parents and elderly relatives dependent upon single men. Their places will be kept open for them; and on their return the Directors propose to give them a bonus "which will put them in a position to resume their ordinary vocation in life without disadvantage or disability—or something a little better." In addition, the Company are contributing 300 guineas to the Prince of Wales's Fund. Proof of the spirit of loyalty which is animating all gas workers at this crisis in the country's history was furnished by Mr. Joseph Cash and Mr. F. W. Cross.

The Local Secretary of the Gas-Workers' Union, who had presented an application for increases on behalf of certain Corporation workmen at Blackburn, has received a note from headquarters stating that, "in view of the conditions throughout the country and the European war, we do not wish to raise questions which may now cause conflict. The time is one for industrial peace among the inhabitants of every town; and accordingly you can inform the members that we do not at present propose to submit their claims."

So far, 75, or rather more than 10 per cent., of the employees of the Croydon Gas Company have been called up for active service. As was seen a fortnight since, the Directors are looking after the men's dependants.

The employees of the Cardiff Gas Company who have given their services to the country will be under no financial disability by their patriotic action, as the Directors have guaranteed to make up any difference between the Government allowance and their wages in full, as a mark of their practical sympathy and encouragement. Needless to say, the General Manager and Secretary (Mr. George Clarry) reports, the places of those who have gone on active service will be kept open; such absence to count as continuous service with the Company.

Some 73 of the employees of the Wandsworth, Wimbledon, and Epsom Gas Company have gone on active service under the flag; and Mr. H. E. Jones, the Chairman, says that fresh volunteers are of daily occurrence. The dependants of the men are being looked after by the Company during the absence of the bread-winners.

The General Purposes Committee of the Barrow-in-Furness Corporation at a recent meeting decided that (*a*) any officer or servant affected by the mobilization or embodiment, consequent on the European crisis, be allowed leave of absence during his term of naval or military service; (*b*) that he be reinstated on his return, without loss of position or emoluments consequent on his enforced absence; (*c*) that the Corporation declares its intention to provide adequately for the wives and dependants of such officers and servants during such period, and that it be referred to the Chairman of the Standing Committee's Committee to determine the amount of financial aid to be paid to such wives and dependants, and in the meantime half-wages be paid them; (*d*) that the respective Committees be authorized to make such temporary arrangements as may be necessary for carrying on the work of such officers and servants in their absence.

The Gas Committee at Mossley are to pay the dependants of the employees who have been mobilized 12s. 6d. a week.

We are informed by Mr. J. H. Crowther, the Engineer and Manager of the Wallasey Gas and Water Department, that the Council have passed a resolution that all Council employees who have been called out on active service be paid as follows: Married men, to receive full wages, less separation allowance; single men with dependants, to receive full pay; single men without dependants, to receive full wages, less army pay; bonuses (if any) to remain as at present.

A largely-attended meeting of officials and workmen of the Belfast Gas-Works last week approved of a scheme submitted by the Gas Manager (Mr. J. D. Smith) for helping the War Relief Funds by weekly contributions ranging from 3d. per week on wages of between 20s. and 30s. to 1s. in the case of those receiving 50s., members of the official staff to contribute in proportion to income, and subscriptions to be continued for three months. The amount subscribed for the first month will be given to the Prince of Wales's National Relief Fund. This is the first public department scheme of the kind in Ireland.

The chief officials at the Salford Town Hall held a meeting last week, at which it was agreed that the employees in all departments should be recommended to give not less than 2½ per cent. of their salaries to the fund.

The calling-up of the Reservists and Territorials has depleted the staffs of the various Corporation departments at Blackburn by over fifty men. In the Gas Department there are twelve army reservists and one territorial (Mr. J. C. Wynne, the Assistant Gas Manager), besides two army reservists and one ambulance man in the Lamps' Department. Several men employed at the water-works have also been called up.

A contribution of £100 has been given by the Portsmouth Water-Works Company to the local War Distress Fund at Portsmouth.

The Directors of Messrs. Fletcher, Russell, and Co., Limited, of Warrington, have decided to make an allowance of 10s. per week to the wives, and 1s. per week for each child under fourteen years of age, of their employees called to serve the country, with the exception of Reservists in specified Regiments who have been married off the strength, and to the wives and children of whom the War Office authorities have decided to grant separation allowances under the same conditions as to soldiers married on the strength. The firm intend to make a weekly allowance to the wives and children of such Reservists, and will also make allowances in other deserving cases. Payments will be made at the offices on Saturday morning each week.

The Directors of the Gas-Meter Company, Limited, have decided to make a weekly allowance until further notice to wives and dependants of all their employees who have been called-up for service; and their places will be retained for them until they return. The Company are prepared to carry on the works in the usual way during the war, and do not anticipate any dislocation of their business, as they have ample stocks of both material and finished goods.

The Richmond Gas Stove and Meter Company, Limited, have forwarded £500 to the Prince of Wales's National Relief Fund, and have also made arrangements for weekly payments to the wives and families of the men in their employment who have been called to the war.

Engineers and Secretaries of gas undertakings are invited to send information for inclusion in these notes. No particulars can be published except from responsible members of gas administrations or officials, and from our own regular correspondents.

Marriage of Miss Offord.

Last Thursday, Miss Dorothy Evelyn Offord, daughter of Mr. C. W. Offord, was married at St. Andrew's Church, Enfield, to Mr. Alec. G. Troughton. Among the guests at the church and the subsequent reception were Col. Sir Alfred Somerset, K.C.B., and Lady Somerset, Mr. and Mrs. A. E. Broadberry, Mr. and Mrs. Reginald W. Foster, Mr. and Mrs. Walter King, Mr. and Mrs. Lennard, Mrs. Normand and Mr. Rae Normand, Mr. and Mrs. Surridge, and Mr. and Mrs. R. Wardell. The presents received by the bride included gifts from the above-mentioned guests, and also from Mr. and Mrs. Jacques Abady, Mr. and Mrs. Barton, Mr. and Mrs. Charles Clare, Mr. and Mrs. Thomas Glover, from many more of Mr. Offord's friends in the gas profession, and from a wide circle of others not intimately connected with the gas industry. Sir Alfred Somerset, who was Chairman of the Enfield Gas Company for many years, and up to its amalgamation with the Tottenham and Edmonton Company, very kindly lent the Riding House at Enfield Court for the reception, and both he and Lady Somerset afterwards showed the house and gardens to many of the guests. At the reception, a trio, under the direction of Miss Dora Thorpe, gave selections for the entertainment of friends of the family.

Consequent on the death of the Chairman of the Bury St. Edmund's Gas Company, Mr. Alexander Mitchell—for the last 33 years Manager of the Company, and before that at Dundee with the late Mr. B. M. M'Crae—has been appointed to a seat at the Board.

THE SOUTH METROPOLITAN GAS COMPANY'S NITRATE OF THORIUM STORE.

An Explanation by Mr. Charles Carpenter, D.Sc.

THE attitude of the South Metropolitan Gas Company in placing at the disposal of the gas industry of the United Kingdom a large proportion of its stock of the essential chemicals used in the manufacture of incandescent mantles, appears to have been misconstrued in certain quarters; and I shall be obliged if you will allow me to put the matter before your readers in its proper light.

It is nearly eleven years ago that I suggested to Sir George Livesey the desirability of gas undertakings protecting themselves in the matter of incandescent mantles by storing thorium nitrate. I was led to do so by knowledge of the fact that one of our largest manufacturers of armour plates stocked nickel, which was as essential to them as thorium to us, in quantities which represented a considerable amount of capital lying idle—if my memory serves me aright, the figure was something like £320,000. Sir George warmly approved the idea; and not long afterwards, we made our first purchase—building a specially designed store for housing safely such valuable chemicals. From time to time, we increased our stock; and although we had to pay very heavily for it compared with prices current before the war, we have never regretted our investment. We should be quite content to go on holding this, but, in face of the national contingency which has arisen, decided to sell as far as might be possible or required.

The price we are asking is a very high one; but, high though it is, **we shall not reap by it any more profit than the actual cost to us of our venture.**

Let me, in conclusion, enumerate the requirements of mantle manufacture; and your readers will then be in a position to judge by how much the figure of ¾d. extra cost per inverted mantle given by Mr. M'Leod in the last issue of the "JOURNAL" is likely to be justified:

(1) **Nitrate of Thorium. Extra cost ¾d. per mantle.**
(2) **Nitrate of Cerium. No charge is made for this chemical, which is given in the required proportion to purchasers of thorium.**
(3) **Beryllia. This is used in quantity not exceeding ½ per cent. of the above—to harden, and whiten the light given by, the mantle. Its use is comparatively recent, and its preparation is simple.**
(4) **Mantle fabric. Our textile manufacturers are not likely to fail us in this respect if ramie is used. There would probably be more difficulty in the production of artificial silk.**
(5) **Fire-clay rings. Certainly can be made in Britain.**
(6) **Asbestos twine to tie the fabric to the holder. Asbestos comes from Italy and Canada. It is largely manufactured in England; and there should be no difficulty in making twine.**
(7) **Collodion for dipping. Easily prepared here.**
(8) **Boxes to hold the finished article. The supply of them not likely to be troublesome.**

Is it too much to hope that gas undertakings will learn the lesson of the present crisis, and make in future adequate provision for ensuring supplies of the chemical necessaries of mantle making? The cost would not be great if everyone took a share. **When the time is ripe, we should be very pleased to purchase, store, and insure on behalf of those who favourably entertain the proposal.**

CHARLES CARPENTER.

South Metropolitan Gas Company,
Aug. 22, 1914.

To H.R.H. THE PRINCE OF WALES,
BUCKINGHAM PALACE, LONDON.

I beg to enclose £ s. d. as a donation to the National Relief Fund.

*Name*_____

*Address*_____

_____

The envelope containing this coupon need not be stamped.

THE NITRATE OF THORIUM POSITION.

Criticism of the Articles in Last Week's Issue.

THERE are usually two sides to a question; sometimes more than two. Multiplicity of sides naturally makes a question more confusing, and renders it more difficult to get at the truth. The main fundamental ingredient in mantle manufacture—the nitrate of thorium—and the monazite sand from which it is derived, have jointly and consistently been the subjects of many tales regarding the points of control, fair prices, profits, and so on; and the best of our friends cannot assure us that we are false to our own intelligence when we say that there is, by those chiefly concerned, a pretty effectual veiling from outside inquisitive eyes of the actual conditions of things. No one can deny us the right to believe in the partially negative results of our own efforts a time ago to penetrate further behind that veil than the point at which we had been successful in arriving. In what has been done, in what there has been an attempt to effect, we are told there is nothing more than genuine business, and the right to make the best of one's successes. Let that remain. The point at the moment is that existing circumstances find this country without stocks of nitrate of thorium of any considerable amount, other than that in the possession of the South Metropolitan Gas Company; and this, we hold, is not the position that the United Kingdom should be in—especially while India possesses deposits of sand the nitrate of thorium from which is not even in normal times available to this country other than in the form of completed mantles.

However, all this by way of introduction to the main purpose of this article. A visitor called at these offices the other day at our request, with the purely friendly object of showing that some of the statements in our leading article of last week on the subject of nitrate of thorium were not correct, and that, in respect to other statements, there was another complexion than the one then put upon them. The first point of our article criticized by our friend was the statement that during the length of the war, there would be a void in the supply of nitrate of thorium to the British mantle manufacturers from the German syndicate "who had so effectually controlled it." Our visitor declares that the indication there of something tantamount to a "corner" in nitrate of thorium, and of an absolute control, is not correct, as there are quite a number of "independent" thorium manufacturers on the Continent (in Germany as well as in France) who are the opponents of the German Auer Company, who are the sole consignees of the Travancore (India) monazite sands. The question then is, Who are at the present time the independent thorium manufacturers on the Continent? The reply of our visitor is, the thorium manufacturers who are outside the Auer concern; and they are in competitive business with each other. These firms, he says, deal with the nitrate of thorium produced from the Brazilian monazite sands. When the question of a renewal of a contract with the Brazilian Government was under discussion in 1905, the controllers of the Brazilian monazite sand were Messrs. Gordon and De Freitas; and they disposed of their sands to Messrs. Sthamer, De Haen, Kuhnheim, and Knoeffler, and the Austrian Welsbach Company. This group, whether since altered in constitution or not, has always been known on this side as the German Thorium Syndicate. But our critic emphatically asserts that they are independent manufacturers, in open business, like anyone else, who are in normal times quite willing to execute orders for thorium nitrate for England or any other country. In fact, to use his words, "there is quite a healthy competition apart from the supplies which reach this country from France." This he did admit, that there had been an attempt to get the thorium makers together to fix prices, but there had been no attempt at a trade combination. The thorium makers, he said, could not be "got under one hat," because the sand people were not amenable to similar co-operation. All we need say at the moment is that, if there is not a concrete combination, there has been the effort to get something that possesses the attributes of one; and, as a matter of fact, the market price quoted for nitrate of thorium indicates, if there is no combination, a remarkably harmonious view as to the price that should be charged. The Travancore sands coming from India, the German monopoly in their use is contrary to the commercial and economic interests of this country, and to the safety of the British gas industry. Something this country wants that is found in India is tied up in the hands of a Company in Germany. And that is the plain truth of the matter.

The second point to which our critic took exception was the one as to the supply of nitrate of thorium to this country being regulated, and the British mantle makers being fed with thorium (so to speak) by a spoon. The reason, he explained, why they have been fed in "spoonfuls" is because they could not handle more nitrate of thorium than was demanded by the quantity of business they did; and neither they nor anybody else in the business ever anticipated such an emergency as that which has arisen. In fact, he asserts that from Germany there has been only one attempt at regulation of the supply of thorium to this country, and that was for a period when the question of raising the price was under discussion, in order to make it profitable to the makers. It was during that time, and that time only, that the thorium people (who were manifestly acting in concert then) said the British makers should not have more than sufficed for current needs, seeing that

there might have been an attempt to stock the cheaper thorium against a rise in price. By the way, it is said there are no mantle makers among the thorium manufacturers to whom we are now referring (those dealing in the nitrate of thorium from the Brazilian sands); and, our visitor further says, to the best of his belief, they are not interested in mantle factories beyond their commercial transactions in thorium. But to return to the question of control of the supply of thorium nitrate to British makers, and the denial that, excepting that once, there has been any control, our critic says it was open to the British makers to have had all they could take. The fact of present shortage is due to abnormal circumstances and demand; seeing that, in normal times, there was no necessity for the makers to invest large sums of money for accumulating stocks of nitrate of thorium. The chief blame for the present condition of things our visitor places at the doors of those British gas undertakings which have had no consideration for the mantle-making concerns and trades that have laid out money in establishing works in this country. Some German factories, through various causes, supply cheaper than is the case in this country; and, this being a free-trade country, many gas undertakings and the trade have hitherto adopted the policy of buying in the cheapest market. It is due to this want of support of the British makers that there are such large imports from Germany into this country; and, in turn, we have here supplied one reason why, through the limited patronage of British factories, the German factories reap an advantage in the matter of cheaper production. There are large factories in Germany which work almost, if not exclusively, for the British markets. These factories are virtually kept going by the British buyers, some of whom have even been known to "turn-down" British mantle-making firms over a difference of merely 3d. or 6d. a gross in favour of German-made mantles—on price alone, and no question as to quality.

Reverting to the nitrate of thorium situation, our visitor fully agreed that there was not much of the material in this country save the thousands of kilos. in the stores of the South Metropolitan Gas Company—that is to say, he was careful to explain, "not much" in relation to the large void created in mantle supply by the stoppage of the German export trade. There would have been no shortage if there were only the ordinary demands upon the British makers to be dealt with; and the British makers did not legislate for war conditions, and the cessation of Germany's export business. Such eventualities were not anticipated. Our visitor proceeded to deal with the proposal of the South Metropolitan Company that they should be reimbursed, as far as possible, their outlay on the store of nitrate of thorium (in respect of the proportion required) which they fortunately have, and have kept for a decade, by being paid for it at the rate of ¾d. for inverted and 1d. for upright mantles. This, the critic points out, is equivalent to asking 90s. per kilo (the price named) for the nitrate, which is four times the pre-war price. He thinks the price puts out of court any idea the Company may entertain that they are the benefactors of the industry and of the public.* Furthermore, he says it is altogether incorrect of the Company to put a price upon the mantles as an extra for their nitrate of thorium in order to lead buyers to suppose that the ¾d. or 1d. is the sum-total of the extra they should pay. The ¾d. and the 1d., it is stated, will only just cover the difference between the pre-war 23s. per kilo, and the 90s. now asked. The critic thinks the Company might have taken the British mantle makers into their confidence, and not have adopted (as he thinks it) the arbitrary course of fixing the price as they have done. He quite agrees with the mantle makers' advertisement in last week's issue (p. 417). The South Metropolitan Gas Company, he says (if they wanted to protect their customers), made a mistake, in laying in a store of nitrate of thorium only; they ought to have also provided all the other materials that are required for mantles, since, if other ingredients fail, there would not be any use for their stock of thorium. The British mantle makers possess the works and the skilled hands which the South Metropolitan Company have not got. They have provided something that the Company have not provided; and without the aid of the mantle makers, the nitrate of thorium in the stores of the Company is useless. That is how, our visitor believes, the British makers look at the matter, and that is why they think the Company might have given them a voice in the matter of fixing a price that would not be misleading. At 90s. per kilo, in the state of affairs to-day, he asserts that the mantle makers could not afford to supply at only ¾d. or 1d. more. In his opinion, the South Metropolitan Company's fixing of the price of nitrate of thorium as they have done has had more to do with the precipitate raising of mantle prices than anything else. The critic says he can quite understand that the Company want to get back some of the money they have expended; but he thinks that this could have been done in a better way—by conference first with the whole of the home makers.

These are the views of a man who is largely interested in the nitrate of thorium and mantle industry. The South Metropolitan Company have, of course, their views; he has his, and there is no objection to the free expression of opinion. But the point about the whole of the criticism that strikes us most is the blame that is placed upon British gas undertakings for the present position by their greater support of mantle factories in Germany than of the home ones. That is something worth considering—not only now, but (let us italicize this) *when the war is over.*

* See Mr. Charles Carpenter's communication in the first column of the previous page.

THE EFFECT OF THE WAR ON THE GAS-LIGHTING INDUSTRY.

[Special, from the "Engineering and General News Agency."]

It is known that the effect of the war upon the gas-lighting industry has been to put a stop to the enormous importation into this country of gas-mantles from Germany. Official statistics published in Germany only a comparatively short time before the outbreak of the war reveal the fact that no less than 65,666,389 gas-mantles were last year exported from Germany, weighing 356 metric tons. Of these, 195 tons were sold in England, representing nearly 36 million mantles.

It is obvious that—at any rate, during the war—these mantles must now be manufactured in England. It can be assumed that the fabric itself will offer no difficulty to our manufacturers; the chief difficulty, as was pointed out in the "Journal" last week, will be to obtain the impregnating substance—viz., the nitrate of thorium, of which Germany has had the monopoly hitherto. Regarding the monazite sand from which the nitrate of thorium is manufactured, during 1913 Germany imported 1978 tons from Brazil and 123 tons from Argentina, and another 904 tons were imported in smaller quantities from some other sources. The total value of the monazite sand imported was about £105,000. The amount of nitrate of thorium or monazite sand exported from Germany is extremely small, and official returns do not classify either of these articles separately. As was clearly explained in the "Journal" last week, in reporting Mr. Carpenter's remarks to the shareholders of the South Metropolitan Gas Company, British manufacturers have not been allowed to have much of the nitrate of thorium. On the other hand, there is no reason to believe that Germany possesses any complete control of the deposits of monazite sand in Brazil. The returns of the exports from Brazil for 1913 are not yet available; but in 1912, 3300 tons were exported from there, which, it is seen, is considerably more than the imports into Germany in that year.

The manufacture of thorium nitrate is not a difficult matter; and it is to be hoped that no time will be lost in taking the initial steps. It may be added that Brazil and Argentina are not the only countries from which monazite sand is obtainable. There is a considerable export from India; 832 tons, valued at £24,000, having been exported in 1911 [figures for 1912 and 1913 are not yet available]. A considerable quantity of a material called thorionite has also been sent from Ceylon; but apparently the export of this has ceased. Information in regard to monazite sand in India appeared in the "Journal" last week.

When our manufacturers have reached the point of supplying the necessary gas-mantles for Great Britain, they may also turn to other countries to which Germany has hitherto been exporting them. In 1913, 42 tons of gas-mantles were supplied by Germany to Holland, representing between 7 and 8 million mantles; Russia bought 25 tons of mantles, representing between 4 and 5 millions; Austria, 8 tons, about 1½ millions; Australia, 5 tons, about 900,000; United States, 3 tons, about 500,000; India, 2 tons, about 400,000; Dutch Indies and Argentina about one ton each, representing 200,000 mantles each.

There has also been a fair market for German gas-meters, which it may be hoped Great Britain will be able to acquire. The German statistics include with gas-meters, "water-meters without clockwork." But we think it may be safe to assume that the numbers of the latter are relatively small. In 1913, 1047 tons of meters, of a total value of £220,000, were exported from Germany. Of these, 225 tons were sent to Russia, 221 tons to Belgium, 129 tons to Austria, 63 tons to Switzerland, 55 tons to Holland, 42 tons to Italy, 41 tons to Japan, 40 tons to Great Britain, 30 tons to Spain, 19 tons to France, and 4 tons to Turkey.

Unfortunately it is not possible to complete these figures by computing the enormous supplies of gas-fittings and parts which have been manufactured in Germany recently, as in the German classification they are included in large aggregates of metal work of various descriptions. There is no doubt, however, that the gas-fitting industry of Germany has been an extremely large one, and that in the English market alone tens of thousands, if not hundreds of thousands, of gas-fittings have come from across the North Sea. Our manufacturers will have no great difficulty in obtaining the raw material for making these, nor of producing designs equal to, and better than, those of Germany; and there is certainly no lack of efficient machinery and men for their production. The gas-fittings industry will certainly be one of those which will benefit by the war.

The current number of the "Iron and Coal Trades Review" contains an illustrated article on the new direct ammonia-recovery process which has been adopted in connection with the coking plant at the Beighton Colliery of the Sheffield Coal Company, Limited, consisting of 58 Semet-Solvay ovens, together with the bye-product plant. When the plant was erected by the Coke-Oven Construction Company, Limited, some six years ago, the ammonia was recovered as a concentrated liquor. About a twelvemonth since this system was abandoned in favour of the semi-direct process, in which, however, some important modifications have recently been made.

BRITISH COMMERCIAL GAS ASSOCIATION.

The Glasgow Conference.

We learn from the "Bulletin" of the British Commercial Gas Association for the current month that arrangements had been made for holding the third annual conference in Glasgow on the 13th and 14th of October—opening exactly three years and a day since the conference in the Institution of Mechanical Engineers at which the Association was formed. It will be the first conference held under an elected President; and the writer of the article in the "Bulletin"—"F. W. G."—when giving particulars in regard to it thinks the Association is to be congratulated upon the fact that the President (Bailie Paxton) is one of the leading men in the second city of the British Islands, and that the members will have as hosts the Corporation of that great commercial centre, Glasgow. The programme for the conference is not yet complete in all its details; indeed, it will depend upon the decision of the Executive Committee, to be come to at a meeting to be held this afternoon, whether it will be advisable to postpone the conference, in view of the position of national affairs.

Should the conference be held, the first morning will be occupied, after the formal opening of it by the Lord Provost, by the President's Address, the presentation and discussion of the report and accounts, and the reading of a paper by Mr. D. Milne Watson on the subject of propaganda work for the sale of coke. As readers may be aware, Mr. Milne Watson is the Chairman of the London Coke Committee, who are doing good work in developing the sale of coke, and are employing experts on experimental and propaganda work; and the paper which he has been invited and has promised to read should be of much value, and should lead to a useful discussion. The first morning's business will be adjourned in good time to permit of an official luncheon to be given at one o'clock by the Association (in place of the official dinner held at former conferences). The conference will be resumed at three o'clock and continued until five. After the discussion on Mr. Milne Watson's paper has been concluded, a paper by Mr. Robert Watson (Doncaster) on the relations between gas undertakings and the local gas-fitting and plumbing trades will be taken as the basis for a discussion, as this is a question of very considerable importance, not only, though perhaps mainly, to municipal undertakings, but also to some extent to all. It has been decided to form a Special Committee to consider the question of establishing better relations and working arrangements with the trade; and information on the subject is now being collected. The third and remaining paper to be presented and discussed will be one by the Secretary, Mr. W. M. Mason, on some suggestions for local publicity campaigns, which it is hoped will be found of service by the members. The reading and discussion of these papers will fully occupy the time available up to five o'clock on the first day (Tuesday), and from ten to one o'clock on the second, after which hour the concluding business will be disposed of.

The Corporation of Glasgow will be offering hospitality to the Association on the evening of the first day; and arrangements are in hand for a lecture by Dr. C. W. Saleeby, to which those who are interested in public health, social welfare, and domestic science will be invited. In the evening it is hoped to have a popular lecture delivered by Professor Vivian B. Lewes.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

Programme of the Annual Meeting.

It was briefly intimated in the last number of the "Journal" that the annual meeting of the North British Association of Gas Managers will be held on the 3rd prox. at the Institution of Shipbuilders, Glasgow, instead of at Perth, as had been previously arranged. The change was decided upon at a meeting held by the Council in Glasgow on the 14th inst.; the reason being the present disturbed condition of the country. Only the business upon the programme, a copy of which has been forwarded to us by the new Secretary (Mr. Peter B. Watson, of Wishaw), will be transacted; and there will be no social functions or excursion. The chair will be taken at 10.30 a.m. by the President (Mr. David Vass, of Perth), and the first business will be the confirmation of the minutes of the last annual meeting, the presentation of the reports of the Council and Auditor, the admission of new members, and the consideration of a recommendation by the Council that a contribution to the National Relief Fund should be made from the funds of the Association. These matters having been disposed of, the President will deliver his Inaugural Address, and the reading and discussion of papers will then be proceeded with. There will be two papers—one by Mr. Walter Grafton, of Glasgow, on "The Basis which should Determine the Thermal Value of Commercial Gas;" and the other by Mr. James Dickson, of Johnstone, on "A Year's Experience with Continuous Intermittent Vertical Retorts at Johnstone." After luncheon, Dr. Rudolf Lessing, F.C.S., will deliver the third Young Memorial Lecture; his subject being "Catalysis in Gas Manufacture and Application." After the lecture, the office-bearers for 1914-15 will be elected, the place for holding the next meeting considered, and the President's Medal presented. The meeting will close with the usual votes of thanks and other general business.

Report of the Council.

The report to be presented by the Council furnishes the following particulars:

MEMBERSHIP.

The membership of the Association at June 30, 1914, was 254, as compared with 251 at the close of the previous year—an increase of three. The membership is made up as follows:

Ordinary members	162
Associate members	13
Extraordinary members	72
Honorary members	7
	254

The Council regret to record that the following members have ceased, by resignation or otherwise, to be connected with the Association:—

Ordinary Members.—Robert Cowie, Tillicoultry, deceased; George Graham, Leslie, Fife, deceased.

Extraordinary Members.—Daniel Macfie, Edinburgh, deceased; R. Dundas Orr, Falkirk, deceased; Alex. M'Ara, Glasgow, resigned.

NEW MEMBERS.

In accordance with the rules, the Council desire to recommend the following gentlemen for membership:—

Ordinary Members.—Daniel S. Munn, Gas-Works, Renfrew; John Gibb, Gas-Works, New Cumnock; Daniel Campbell, Gas-Works, Pittenweem; William Calderhead, Gas-Works, Stonehouse.

INSTITUTION OF GAS ENGINEERS' DELEGATE.

Mr. Lawrence Hislop, of Uddingston, has been appointed to represent the Association on the Council of the Institution of Gas Engineers for the year 1914-1915.

COMMERCIAL SECTIONS.

Western District.—It is gratifying to be able to report on the continued good work of the Commercial Section, so ably presided over during the past year by Mr. James M'Leod, Greenock. The interest in the work of this section has been well sustained by the members; the meetings being characterized by larger attendances than in previous years. The total membership now is 37—an increase of two over that of last year. The general feeling is that, if the work of the Commercial Section is to increase in its usefulness, it will be necessary to enrol all gas managers who are members of the North British Association. It is only by such means that a complete record can be made of points of commercial interest which would add considerably to the value of the work in this department. The questions raised for discussion throughout the year included points in the control of vertical retorts, liquid ammonia, gas and water heating, national insurance, workmen's compensation, and others of equal interest. The information secured in the course of a free interchange of opinion continues to be of the greatest value to the members. As regards the financial condition of this section, there is a balance in hand at the end of the year amounting to £27 1s. 1d.

The success of the Commercial Section (Western District) as it stands to-day is attributable in no small measure to the faithful work of the retired Honorary Secretary and Treasurer, Mr. P. B. Watson (Wishaw), who resigned from this post on his appointment as Secretary and Treasurer to the North British Association of Gas Managers. This section records its appreciation of these services, which began with its inception. Mr. James M'Leod (Greenock) relinquished the position of President after two years' worthy occupancy of the chair, and has been succeeded by Mr. Alex. Mackay (Motherwell).

On behalf of the Committee,
(Signed) JAMES BELL, Secretary and Treasurer.

North-Eastern District.—The Commercial Section still continues to serve a very useful purpose in the circulation among its members of important information regarding residuals. The membership of this district is 31. There have been five meetings held during the year at the following towns: Dunfermline, Dundee, Kirkcaldy, Arbroath, and Leven, with an average attendance of 13. At these meetings all matters of commercial interest are discussed, and there is a free interchange of opinion, which have proved exceedingly helpful to the members.

(Signed) R. S. JOHNSTON, Secretary.

BENEVOLENT FUND.

During the financial year ending June 30, 1914, one application for assistance from the fund was received, and, after careful inquiry by the Council, a donation was granted. The amount at the credit of this fund is now £638 11s. 9d., out of which the sum of £586 4s. 9d. is invested in North British Railway Company 3 per cent. debenture stock at a price which yields nearly 4 per cent. interest annually.

ACCOUNTS.

The statement of accounts and balance-sheet for the year ending June 30, 1914, duly audited by Messrs. David Spalding and Muir, C.A., are appended to the report. They show that the affairs of the Association are in a sound financial condition. [On the general fund, the cash in the bank is £94 6s. 9d.]

WILLIAM YOUNG MEMORIAL LECTURE.

The Council are pleased to report they have secured the services of Dr. R. Lessing to deliver the third lecture at the annual meeting; the subject being "Catalysis in Gas Manufacture and Application."

SECRETARY AND TREASURER.

The Council desire to report that Mr. Lawrence Hislop, of Uddingston, who has acted as Secretary and Treasurer to the Association for the past seven years, has resigned from this position, and that, after consideration, they have unanimously appointed Mr. Peter B. Watson, of Wishaw, to act as Secretary and Treasurer.

COMPARATIVE WORKING RESULTS OF THE LONDON AND FOUR SUBURBAN GAS COMPANIES.

IN THE HALF YEAR ENDED JUNE 30, 1914.

Compiled by Mr. F. J. BRADFIELD, the Secretary of the Commercial Gas Company.

——	Gaslight and Coke.	South Metropolitan.	Commercial.	Brentford.	Wandsworth.	South Suburban.	Tottenham.
Gas sold . . . . . thousands	14,059,454	6,883,828	1,713,851	1,793,347	1,276,607	1,109,029	1,162,347
Increase . . . . . per cent.	1·88	2·29	1·68	7·42	7·92	7·30	5·69*
Gas made per ton of coal . . . . cubic feet	12,367	12,476	13,754	12,039	12,881	12,969	13,148
„ „ per gallon of oil . . . . „	442	..	461	443	487	413	457
Gas unaccounted for . . . . . per cent.	7·52	2·52	6·94	4·11	7·38	3·28	5·34
Coke made for sale per ton of coal . cwt.	9·82	8·63	11·03	10·21	10·39	10·49	9 39
Tar made per ton of coal . . . . galls.	10·43	9·57	10·90	10·27	10·16	9·42	..
Liquor made per ton of coal . . . galls, 8 oz.	36·94	41·16	38·95	36·43	36·65	37·36	37·50
Percentage of coke used as fuel	20·67	30·05	11·73	18·31	16·84	19·32	24·35
Capital expended per 1000 cubic feet sold during the past year	s. d. 10 8·55	s. d. 7 9·95	s. d. 8 5·31	s. d. 7 : 0·87	s. d. 7 2·29	s. d. 9 8·04	s. d. 8 7·80
Price charged per 1000 cubic feet	2/6, 2/10, 2/2	2 2	2 4	2 4	1/9 to 2/10½	2/3 to 4/-	2/- and 2/8
Costs per 1000 Cubic Feet of Gas Sold.							
REVENUE ACCOUNTS.	d.	d.	d.	d.	d.	d.	d.
Coals, oil, &c.	15·71	15·21	15·33	14·89	17·36	18·12	16·06
Less residuals—Coke and breeze	5 71	5·54	4·28	4·30	6·04	5·81	4·98
Tar	1·73	1·88	1·40	1·32	1·85	1·76	1·28
Amm. liq. and sulph. amm.	1·95	2·34	1·65	0·86	1·65	1·64	1·36
Total residuals . . .	9·39	9·76	7·33	6·48	9·54	9·22	7·62
Net for coals . . .	6·32	5·45	8·00	8·41	7·82	8·90	8·44
MANUFACTURE—							
Salaries	0·27	0·67	0·43	0·44	0·24	0·62	0·27
Wages—carbonizing	1·66	1·74	1·43	1·43	1·66	1·24	1·67
Purification	0·25	0·66	0·22	0·24	0·27	0·09	0·29
Repairs—plant	4·20	4·35	3·50	3·93	4·16	2·38	3·00
Net manufacture . .	12·70	12·87	13·58	14·45	14·15	13·23	13·67
DISTRIBUTION—							
Wages and salaries	1·05	0·78	0·84	1·11	1·25	1·40	1·04
Repairs—Mains and services, &c.	1·70	1·52	1·42	2·31	2·14	2·57	3·09
„ Meters and prep. meters and fittings	1·75	2·57	2·08	1·04	1·11	2·89	1·95
„ Stoves—ordinary and prepayment .	1·68	1·56	1·70	1·75	1·72	1·26	1·29
Total net manufacture and distribution .	18·88	19·30	19·62	20·66	20·37	21·35	21·04
Public lamps—lighting and repairing	0·45	0·58	0·44	0·44	0·53	0·89	0·39
Rents, rates, and taxes	2·99	1·88	2·42	1·84	1·04	1·92	2·00
MANAGEMENT—							
Directors, Auditors, and salaries (Secretary, &c.)	0·23	0·27	0·32	0·42	0·58	0·72	0·50
Collectors	0·46	0·59	0·79	0·50	0·44	0·50	0·46
Stationery and general charges	0·25	0·62	0·46	0·31	0·55	0·38	0·52
Profit-sharing	0·39	1·02	0·51	..	0·53	0·77	0·70
Bad debts	0·08	0·06	0·05	0·07	0·04	0·03	0·03
Law and parliamentary charges	0·06	0·02	0·06	0·32	0·01	0·12	0·03
Superannuations, &c.	0·47	0·28	0·33	0·48	0·40	0·63	0·36
National Insurance	0·08	0·12	0·08	0·07	0·09	0·08	0·07
Sundries	0·04	0·03	0·02	0·00	0·01	..	..
Total expenditure (*less* residuals) . . .	24·38	24·77	25·01	25·11	24·59*a*	27·39	26·10*a*
GAS	29·43	26·09	27·43	28·13	25·17	30·29	25·17
Rentals—Meters and prep. meters and fittings	2·81	3·33	2·82	3·46	2·77	2·37	1·94
Stove	1·24	1·33	1·70	1·02	2·13	1·61	4·01
Incand. mantle maintenance . . .	..	..	0·11	..	0·46	..	0·16
Miscellaneous	0·10	0·05	0·01	0·01	0·09	0·10	0·07
Total—Gas, rentals, &c.	33·58	30·80	32·07	32·62	30·62	34·37	31·35
Balance, being profit	9·20	6·03	7·06	7·51	6·03	6·98	5·25
Dividend and interest	10·37	7·35	9·01	6·81	6·46	8·31	6·10
Surplus	Def. 1·17	Def. 1·32	Def. 1·95	0·70	Def. 0·43	Def. 1·33	Def. 0·85
Contribution to funds	0·26†	..	..	..	..	..	1·86‡
SUNDRIES.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Coals cost per ton	16 9·70	15 2·68	17 7·87	..	17 8·40	19 7·70	18 10·79
Coke realized per ton of coal	6 7·57	5 2·91	6 2·97	6 9·99	6 6·32	6 6·65	6 8·00
Coke „ „ of coke	13 5·98	12 1·73	11 3·90	13 4·54	12 6·69	12 5·99	14 2·32
		Per Yard.				Per Yard.	Per Chal.
Breeze „ per ton	4 3·19	1 6·02	3 3·27	3 1·92	1 4·08	2 1·98	1 10·79
Tar realized per gallon	0 2·49	0 2·36	0 2·04	0 1·96	0 2·33	0 2·58	0 2·16
Amm. liquor, &c., realized per butt (8 oz.) . .	7 1·60	6 1·71	6 11·32	4 0·95	5 4·32	5 5·42	5 4·63
Percentage of stoves at rental to consumers . .	77	96	67	79	..	91	61
Bad debts per cent. on total receipts.	0·19	0·15	0·13	0·18	0·10	0·07	0·07
Net profit per cent. on ordinary capital . . .	4·03	4·29	4·68	14·06	5·78	4·77	4·69
One penny variation equals in half year . . .	£58,581	£28,682	£7141	£7472	£5319	£4621	£4843
Carb. water gas, per cent. on total make . . .	24·72	..	30·99	41·13	10·96	10·22	25·96

† Redemption Fund. *a* Capital Duty eliminated. * On Amalgamated Co.'s figures. ‡ Compensation and Stock Redemption.

Mr. FREDERICK N. SKINNER, Works Superintendent to the City of Waterford Gas Company, has been the recipient of a silver-mounted walking stick, a fountain pen, and a pocket-book, on the occasion of his leaving the Company's service to take up the position of Secretary and Manager of the Gowerton Gas Company. The presentation was made by the Manager (Mr. J. Paterson), who spoke of the excellent manner in which the recipient had invariably discharged his duties. Mr. Skinner was at Waterford for four years, previous to which time he was on the Wallasey Corporation Gas and Water Department staff.

COMPARATIVE WORKING RESULTS OF THE LONDON AND FOUR SUBURBAN GAS COMPANIES.

TABLE SHOWING THE VARIATION, INCREASE OR DECREASE, ON FIGURES OF CORRESPONDING HALF YEAR, 1913.

[The figures in heavy type show the decreases.]

Compiled by Mr. F. J. BRADFIELD, the Secretary of the Commercial Gas Company.

	Gaslight and Coke.	South Metropolitan.	Commercial.	Brentford.	Wandsworth.	South Suburban.	Tottenham.
Gas sold . . . . . thousands	259,274	154,467	28,408	123,893	93,651	75,509	191,652*
Increase (variation equal to) . . . per cent.	**1·35**	·70	·33	**·04**	**·95**	2·95	**2·60**
Gas made per ton of coal . . . . cubic feet	147	162	559	28	265	257	247
,, ,, per gallon of oil . . . . ,,	4	..	23	11	54	413	**1**
,, unaccounted for . . . . . per cent.	·09	·03	1·06	**·81**	2·29	**1·08**	·66
Coke made for sale per ton of coal . cwt.	**·16**	**·63**	·12	**·61**	**·16**	·35	·21
Tar made per ton of coal . . . . galls.	·72	·00	·32	·78	·22	·03	..
Liquor made per ton of coal . . . galls, 8 oz.	**·62**	·72	**·62**	·44	3·10	**·75**	**·32**
Percentage of coke used as fuel	·11	5·09	**·96**	4·83	1·26	**2·96**	·18
Capital expended per 1000 cubic feet sold during the past year	s. d. **0 0·31**	s. d. **0 1·64**	s. d. **0 0·85**	s. d. **0 2·12**	s. d. o 0·53	s. d. **0 3·16**	s. d. 1 0·68
Price charged per 1000 cubic feet	**2**	..	..	..	..	..	**0 1·00**
Costs per 1000 Cubic Feet of Gas Sold.							
REVENUE ACCOUNTS.	d.	d.	d.	d.	d.	d.	d.
Coals, oil, &c.	·38	**·61**	1·44	**·01**	1·06	**·02**	1·40
Less residuals—Coke and breeze	**1·84**	**1·93**	**1·35**	**1·54**	**1·88**	**2·22**	**·55**
Tar	·08	**·15**	**·22**	**·35**	**·15**	**·37**	**·20**
Amm. liq. and sulph. amm .	**·29**	**·23**	**·31**	**·29**	**·19**	**·74**	**·24**
Total residuals . . .	**2·05**	**2·31**	**1·88**	**2·18**	**2·22**	**3·33**	**·99**
Net for coals . . .	2·43	1·70	3·32	2·17	3·28	3·31	2·39
MANUFACTURE—							
Salaries	**·01**	·02	·01	·02	·07	·06	**·02**
Wages—carbonizing	**·28**	·01	**·02**	·01	**·08**	**·03**	·25
Purification	**·07**	**·13**	·01	**·01**	·01	**·12**	**·07**
Repairs—plant	·13	·48	**·19**	**·99**	**·59**	·02	**2·30**
Net manufacture . .	2·20	2·08	3·13	1·20	2·69	3·24	·25
DISTRIBUTION—							
Wages and salaries.	·00	·01	·02	**·09**	·04	**·01**	·05
Repairs—Mains and services, &c. . . .	·04	**·04**	·11	**·29**	**1·45**	·11	**·72**
,, Meters and prep. meters and fittings	**·11**	·11	**·06**	·06	**·10**	**·17**	·44
,, Stoves—ordinary and prepayment .	·12	**·01**	·09	·32	**·23**	**·53**	·19
Total net manufacture and distribution .	2·25	2·15	3·29	1·20	·95	2·64	·21
Public lamps—lighting and repairing	**·02**	·05	·06	**·17**	**·02**	·12	**·07**
Rents, rates, and taxes	**·03**	**·24**	·16	·05	**·01**	**·09**	·08
MANAGEMENT—							
Directors, Auditors, and salaries (Secretary, &c.)	·00	**·01**	**·03**	**·05**	·00	**·02**	·04
Collectors	**·01**	·00	·00	**·05**	**·04**	**·03**	**·02**
Stationery and general charges	**·01**	·11	·02	**·03**	·03	**·09**	·02
Profit-sharing	**·01**	**·13**	**·04**	..	·12	·12	·13
Bad debts	**·03**	**·01**	**·01**	**·01**	**·05**	**·01**	·00
Law and parliamentary charges	·02	**·04**	·01	·30	**·04**	·09	**·16**
Superannuations, &c.	·00	**·26**	·01	·05	·01	**·03**	·24
National Insurance	·01	**·01**	·01	·00	·00	·08	·00
Sundries	·00	·01	·00	·00	·00	..	..
Total expenditure (*less* residuals) . . .	2·17	1·62	3·48	1·29	·95	2·78	·47
GAS	**·10**	·02	**·01**	**·59**	**·05**	·04	·14
Rentals—Meter and prep. meter and fittings	·13	·11	·11	·13	·05	·16	·04
Stove	·07	·06	·06	·08	·17	·11	·04
Incand. mantle maintenance . . .	..	..	**·01**	..	·05	..	**·03**
Miscellaneous	·00	·00	·00	·00	·01	·06	·03
Total—Gas, rentals, &c.	·10	·19	·15	**·38**	·23	·37	·22
Balance, being profit	**2·07**	**1·43**	**3·33**	**1·67**	**·72**	**2·41**	**·25**
Dividend and interest	**·10**	**·07**	**·17**	**·40**	**·07**	**·49**	·67
Surplus	**1·97**	**1·36**	**3·16**	**1·27**	**·65**	**1·92**	**·92**
Contributions to funds, &c.	**·57**	..	..	..	..	..	1·86
SUNDRIES.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Coals cost per ton	1 4·56	**0 4·74**	2 4·00	..	1 2·34	1 5·82	2 0·42
Coke realized per ton of coal	**1 1·45**	**1 11·97**	**2 2·93**	**1 4·59**	**2 0·18**	**1 2·53**	**0 8·56**
Coke ,, ,, of coke	**2 0·50**	**3 5·89**	**4 2·84**	**1 9·67**	**3 7·58**	**2 10·46**	**1 10·67**
		Per Yard.				Per Yard.	Per Chal.
Breeze ,, per ton	**1 2·27**	o 2·20	**0 1·86**	**0 2·33**	**1 4·59**	**0 3·22**	**0 1·03**
Tar realized per gallon	o 0·24	**0 0·15**	**0 0·32**	**0 0·33**	**0 0·24**	**0 0·15**	o 0·04
Amm. liquor, &c., realized per butt, 8 oz. . .	**0 0·07**	**0 7·80**	**1 5·08**	**0 9·76**	**1 2·32**	**1 3·52**	**0 11·03**
Percentage of stoves at rental to consumers . .	3	3	3	..	..	6	8
Bad debts per cent. on total receipts	**·06**	**·02**	**·01**	·01	**·11**	**·01**	**·01**
Net profit per cent. on ordinary capital . . .	**1·40**	**1·25**	**2·17**	**2·46**	**·78**	**1·59**	**·93**
One penny variation equals in half year . . .	£1080	£643	£118	£516	£390	£315	£798
Carb. water gas per cent. on total make . . .	8·77	..	**4 07**	7·20	**0·3**	10·22	**·85**

* These figures represent the variation on the absorbing Companies' own figures, and not on those of the amalgamating Companies, whereas on the preceding table the increase on the "Gas Sold" is on the amalgamated figures.

Mr. WATSON SMITH has resigned his position as Editor of the "Journal of the Society of Chemical Industry," to take effect at the end of this year. The Council have accepted his resignation with great regret and appreciation of his 33 years' services.

The death is reported, as having taken place on Thursday, the 13th inst., of Mr. SEPTIMUS CATCHPOLE, a partner in the firm of Messrs. E. Catchpole and Sons, tar distillers, of Plough Bridge, Rotherhithe.

ELECTRICITY SUPPLY MEMORANDA.

In the electricity supply industry, there can be no question that, if the war continues for any considerable length of time, there will be a big reduction of business all round this coming autumn and winter. A large part of the business of the industry is dependent upon the power of people to spend money; and the earning power of the country is on the wane. The worst has yet to come. With all the provision that is being made to ward off destitution and the hideous hardships that must follow in the wake of this war, and which time will accentuate and not assuage, there will not be the surplus of normal times to spend in electricity-using entertainment, dining, and shopping establishments. Many of the theatres have already closed-down, there are abridged *menus* at certain dining places, and many well-known business houses have cancelled their advertisements in the daily papers. This is all ominous. Necessity compels economy. We are not by any means gloating over the obvious effect that this must have particularly upon the electrical industry; for the two reasons that it means the reduction of employment, which we all wish to see sustained as much as possible, and that the gas industry, whose business is large in the same classes of establishments, will suffer from the lessened trade therefrom in much the same manner. But the gas industry does not anticipate any considerable falling-off in domestic consumption, for reasons stated in our editorial columns last week. Meantime, there are other aspects of interest in connection with the electricity supply industry. This industry does not employ so much labour in its generating-stations and on its districts of supply as the gas industry; and the result is that not nearly so many men have (only temporarily we quite hope) left it to join the colours. But from the tramways services, there has been an immense exodus of the employees. Like the gas companies and gas committees, the administrative authorities, in most cases have, and unquestionably in all cases will, take upon themselves the duty of looking after the men's dependants, and seeing that there is not any great pecuniary suffering from responding to the call of duty. The manufacturers of electrical plant and appliances generally report that they have lost a fairly considerable number of men, and so have the contractors for installation work, but not more than will about compensate for the reduction of business that is likely to ensue when contracts in hand have been executed. Some electrical manufacturing works may have to partially or wholly shut-down, if the war continues any great length of time, owing to a shortage of material from abroad; and this may also cause a rise in prices. As a matter of fact, certain manufacturers have already intimated that there may be an increase in prices without notice. But there are others among the manufacturers who are hopeful that absence of Continental competition (a large percentage of the electrical manufacturing supplies has hitherto been in the hands of Continental factories) will be of assistance to them now and henceforth. It is further believed that the return to work of the men in the London building trades will help to provide still more work for the London electrical contractors' hands. However that may be, the hope is expressed in the electrical journals that all concerned as employers in the industry will try to maintain employment as near normal level as possible.

The War and Electricity Business.

In his annual report, the Borough Electrical Engineer of Islington (Mr. Albert Gay) bemoans the fact that his load factor does not improve; and that he is kept outside the land of great electrical expectations in this regard so long as hiring powers are denied to him, and he is prevented from working for the development of the cooking, heating, and domestic supply side of the undertaking. He says: "At the present moment there is no chance of popularizing electricity for cooking and heating. It is not that the cost of electricity is prohibitive; but facilities for the general public to obtain the apparatus do not exist. Until an endeavour is made to bring the public into touch with the cooking and heating business by offering them exactly similar facilities to those given by the gas undertakings, I am afraid little hope can be entertained for an improvement in this direction." There is not much ground for the entertaining of hope; seeing, first, that gas apparatus is so much cheaper than electrical apparatus, which fact makes it impossible for the electrical industry to adopt "exactly similar" rates to the gas industry, and seeing too that, while the gas undertakings usually charge lighting rates for cooking and heating, the electrical industry charges prices for those purposes that have no margin to enable it to transfer a portion of the charges for apparatus on to the "profits" from the cooking and heating current. Beyond which electrical energy on the heating basis is so much inferior to gas. Thus this branch of business finds that there is an impregnable opposition on all its frontiers. However, "Electrical Industries" offers Mr. Gay a little consolation. It remarks: "The thing to keep in mind, perhaps, is that, in electric cooking and heating arrangements, we are able to offer a better scheme of things than can be offered by our opponents dependent on gas-operated apparatus. Hence the need for 'exactly similar' terms, at least on the side of cost, are not immediately apparent." There is room for sympathy over the spectacle of such short-sightedness.

"Exactly Similar" Facilities.

In calling attention to a scheme inaugurated by an interested company for extending the use of cartridge fuses, the "Electrician" recently had some rather nasty things to say about contractors who indulge in the folly of cutting prices and of putting in inferior materials—thus assisting in bringing disrepute upon the electrical industry in excess of what it has to bear through natural causes. It is pointed out that very inferior accessories—such as distribution boards and fuses—are put into installations by some contractors who ought to know better. The writer of the article, however, asserts that it cannot very well be ascertained who is responsible for cutting prices in distribution boards and fuse material; and then he goes on to "slate" roundly the contractors for putting in cheap stuff, seeing that it is a part of an installation in which they can "hedge a bit." The logic and discerning power of our friend seem just about as poor as the distribution boards and fuses which he condemns. There does not appear to be much question as to who is responsible. If there were not the demand and sale for cheap material, the electrical accessories maker would not produce it. They are not likely to manufacture a thing continually in large quantities for which there is no sale; but here there is the demand, for "the contractor has got into a very bad habit of using cheap distribution boards, and everyone knows how bad habits stick." However, "the position is an indication of the comparative indifference of the wiring contractor to improvements in fuses and fuse material. Because a cartridge fuse has been more expensive than one of the open clip type, he has given his adherence to the latter, entirely regardless of any superiority which might be possessed by the former. Then comes a very ugly suggestion. "It may be also," says the writer, "that the contractor has looked with disfavour on the cartridge fuse, for one reason that it will not admit of a circuit being over-fused, and for another that it simplifies the replacement operation, and robs him of a certain revenue from the class of customer who telephones, or sends along, to say: "Will a man come to put in another fuse?" Before going on to further urge the use of cartridge fuse material, the writer states another truth in a double-limbed phrase: "The public is chary of fuses, and in any case dislikes the word." "Fuse" implies uncertainty and danger; and many consumers—even Government offices with installations carried out under consulting electrical engineers—have had unpleasant experiences, despite the presence of fuses.

The Cheap Fuse.

The same subject has been dealt with in "Installation Topics" in the "Electrical Times." Contractors and station engineers are urged to maintain a sharp look-out for overloaded fuses on local installations. Danger is seen in the development of the heating and cooking business. It is genuinely feared that householders may connect-up apparatus using more current than the local fuses were intended to carry, and in some cases more than the wiring should be permitted to pass. What a perpetual trouble there is about electrical installations, compared with gas installations which only ask for tight joints to give perfect and permanent safety! The writer refers to the convenience of being able to attach a grill, a toaster, or a small cooker to the nearest electric light fitting; and, with the same dip of ink, to the undesirability of always doing so, in view of the element of risk. When the grill or cooker is attached and switched-on, the local fuse may blow. With the idea of preventing this rehappening, the fuse may be replaced by one of larger capacity—thus materially reducing the factor of safety. Insertion of heavier fuses in a fitting which is quite unsuitable is described as "looking for trouble." A photographic illustration is given of the disastrous effects of a short-circuit on a 15-ampere fuse in a 5-ampere cut-out. The installation was on direct current at 200 volts. The 15-ampere copper alloy fuse was inserted by a contractor when supplying a small cooker for use on the lighting circuit—the original fuse having been one blowing at something over 5 amperes. The user "shorted" the cooker terminals; and although the device was loaded to less than 5 amperes at 200 volts, the heavy fuse failed to blow until considerable damage had been done. When heavier currents are carried than were contemplated when installation was originally made, new fuse fittings should be fixed, and care be taken that the house wiring is of sufficient size to carry the load. Contractors are urged to refuse to connect any apparatus to circuits that would thereby be loaded beyond the safe limit, and to decline to insert fuses which do not provide for a reasonable margin, both as regards the fuse carrier itself and the capacity of the circuit. What an enormous amount of restraint the electrical contractor is expected to exercise in the cause of electrical safety!

Heating and Cooking and Overloaded Fuses.

Charging, as a rule, lower prices for energy used for power, cooking, and heating than for lighting, electricity supply undertakings at times get consumers connecting-up lamps to the low-priced circuits. It is, in fact, rather difficult to prevent this sort of thing without very close observation is maintained throughout the consumers' premises. On the other hand, consumers should be very careful to ascertain that omnivorous electric radiators and cookers are not carelessly

Defeating Fraudulent Consumers.

connected-up to the lighting circuits. There is within knowledge a case where an electric-light user had an electric-radiator fitted in her drawing-room, and which radiator she used, in the colder months of the year, at her "at homes," occasionally in the evening, and frequently on Sunday. The first winter quarter's account came in after the fixing of the radiator. The item for lighting showed an ugly looking rise; while the entire charge for the six-lamp radiator was only between 6s. and 7s. for the quarter!—the charge being 1d. per unit! The radiator was frequently alight, when the family were at home, for twelve or more hours on several Sundays during the quarter. The extraordinary rise in the lighting account led to investigations on the part of the electricity suppliers. A reduction was made in the lighting account without much delay. Thereafter, the lighting account went down; the radiator account went up. Nothing more need be said. It is stated that an Italian engineer has invented a method of preventing the improper use of low-priced power and heating current for lighting purposes. The "Electrical Review" says the inventor advocates the use of special circuits on which the current is subject to extreme fluctuation of voltage at rapidly-recurring intervals, which would make it practically impossible to use lamps, because of the flicker in the light. As the current is not entirely interrupted, and the normal voltage is almost immediately restored, the proper operation of power or heating apparatus is not interfered with; and the rightful use of the circuits for their respective purposes is said to be assured. The system, however, would be fatal to the use of luminous radiators; for the flicker, although only momentary, would be distinctly irritating. The plan seems to be a circuitous one for compelling people to be honest.

Comparing Old and New Engine Plant.

Oil last year was at a fairly high price, and so were all varieties of coal, including steam coal. The abnormal time was hardly a suitable one for the making of cost comparisons, and especially when the comparisons are put forward with several factors unknown, and one party to the comparison has been working under distinctly disadvantageous circumstances. In his annual report, Mr. J. E. Edgcombe, the Electrical Engineer of Kingston-on-Thames, states that, from Sept. 5 last to the end of the financial year, the Diesel oil plant and the steam plant were in use; and he asserts that the cost of generating by oil is practically one-third of that of steam generation. It is, however, explained that the steam plant was only used as a stand-by and for peak load while the oil plant was in use. This being so, the cost of steam generation per unit of electricity was increased. We are not by any means defenders of the steam plant, unless it is run on coke—self-interest and the non-air-polluting character of coke being confessedly points that claim our favourable consideration. The information given by Mr. Edgcombe does not include the respective delivered costs of coal and oil; and his readers do not know the condition of his steam plant. However, in the report it is stated that the cost per unit sold for oil, waste, water, &c., rose from 0·056d. to 0·087d.; this being due to the heavy extra expenditure for lubricating oil for the Diesel plant. But this figure, it is said, will be reduced in future as, during the first six months' work, it was advisable to use an abnormal quantity of lubricating oil with the new engines. Will this figure be reduced? Wages at the generating station rose from 0·252d. to 0·254d. per unit, due to temporary extra cost for labour when training the staff to the use of the new machinery. But with these two exceptions, cost per unit for generation has been reduced. Total works costs are said to have been lowered from 1·867d. to 1·697d. This shows a reduction of 0·17d. per unit, which does not faithfully disclose the one-third cost of generating by oil as compared with the steam plant. The chances are that, as time goes on, the expenses associated with the Diesel plant will reveal themselves rather more definitely and weightily. Our interest in the Diesel plant mainly extends to its work in comparison with the gas-engine. There is, experience clearly shows, a larger capital expenditure per given horse power (chiefly owing to the greater stresses encountered in working, which necessitates a heavier build), a heavier attendance charge—expert supervision being required, as well as more frequent cleaning to keep the working parts clean; and it is also found that the risk of breakdown is greater. Repairs and maintenance will also be found to be anything but negligible quantities. It is the opinion of some users of Diesel plants that, when the total of the costs incurred is found, together with the trouble which they introduce into a works, their advantage is a very doubtful quantity.

Self-Instruction in Gas Supply.—We have received from Messrs. John Allan and Co., of No. 8, Bouverie Street, the second edition of their "Self-Instruction for Students in Gas Supply—Advanced," by "Mentor." It is a continuation and extension of a similar book written for students in Grade I., and is intended for those preparing for the final examination in the above-named subject of the City and Guilds of London Institute. The student is recommended to use the book under notice in conjunction with the elementary one; and at the end of the preface a list of works calculated to be of assistance to him is given. There are seventeen chapters and two appendices, containing the answers to the questions in the Honours Grade in "Gas Supply" at the 1910 and 1911 examinations, by Mr. F. C. Briggs and Mr. S. B. Johnson respectively, who were the silver medallists in those years.

GAS APPLIANCE DESIGN AND UTILIZATION.

THE "Bulletin" of the American Commercial Gas Association for the current month contains the following remarks by Mr. GEORGE S. BARROWS, of the United Gas Improvement Company of Philadelphia (Pa.), on the subject of "A Desirable Trend of Gas Appliance Design and Utilization."

If a few years ago gas companies and manufacturers of gas appliances merited the criticism, not unfrequently heard, of lethargy or neglect, this is no longer the case, at least as regards intent; for everywhere are seen either appliances of new design or novel methods of selling—both, at times, somewhat startling, because of being a radical departure from common practice. Such activities are very generally commended; but is it not possible that because of such approbation, as well as a desire to achieve immediate success, we may lose sight of our goal—continued satisfactory service to our consumers? What is "continued satisfactory service" by any merchant? Is it not the delivery to the purchaser of the commodity he desires, of specified quantity and quality, and at such times or places, or under such other conditions, as agreed upon? If these requirements are not fully met, the service cannot be considered good, and the purchaser trades elsewhere. To the necessary factors for good service, and usually in proportion to the competition, may be added others as inducements to procure or retain trade.

Primarily the commodity we are selling is gas. Its quality is uniform usually at a fixed standard (varying in different localities); the quantity is, except in rare instances, ample; and the delivery is certain and constant. But gas *per se* is of no practical value, as it must be converted into energy in the form of heat, light, or power before it can be of use to the purchaser. So, in the final analysis, the commodity we have for sale is not gas itself, but its potential energy. Now this energy is not available without appliances for its conversion; so, in order to give to our consumers "satisfactory service," we are obliged, either by actual installation or by recommendation, to provide them with proper appliances. In this work lies our great opportunity, for gas is so cheap, and may be used so simply, that some degree of satisfaction is possible even with crude devices often employed for its burning.

For years to come we shall have gas to sell, and we must hope for increased consumption per consumer, in spite of ever more active competition with other forms of energy. More efficient appliances, that will give a greater differential cost in our favour, will be of no small aid; but a greater help will be from appliances that give "continued satisfactory service," that are so designed as to meet all reasonable demands, and that may be readily maintained in such condition as to be used without undue effort by, or annoyance to, the consumer.

If well-designed and carefully constructed appliances are not available, we have only ourselves to blame; for certainly the manufacturers will build what we request. It is easy to follow the lines of least resistance, and often appliances (attractive only because of appearance or novel design) may seem more readily saleable than others of more real worth. This must be impressed on our minds if we intend to sell service rather than appliances only.

Appliances of mediocre construction are less common than they were a few years ago, largely through the efforts of the committees of the associations having charge of appliance standardization. On these committees are representatives of both gas companies and manufacturers, who are co-operating closely for improvement in construction. Such improvements as may be recommended are of but little practical value, however, unless we, who are ordering the appliances, insist on having them. If we are content to be governed by price and appearance rather than by real worth, the improvements we hope for will be long deferred. The actual difference in cost between a really satisfactory appliance and one which is likely to give cause for complaint is so small as to be almost negligible; and it will grow still smaller when we cease to demand novelties which entail on the manufacturers the great expenses of new patterns and tools. True progress will not be retarded, but rather accelerated, for the energy now expended on the production of novelties will be diverted to more substantial advancement.

But, it may be urged, we shall gain by selling more appliances, and by our system of maintenance proper care will be taken to keep them in good order. Good maintenance is most desirable; but it is an expense to the consumer if charged for, and to the company if given free. Actually it is not free, for the consumer must pay for it in the end, and careful consumers pay for the negligence or faults of the careless.

This leads directly to a consideration of the beneficial effects of better appliances on the costs of the distribution and claim departments which should not be overlooked, for these departments, as well as the commercial department, are parts of the complete organization; and whatever can be done to lessen their expenses makes for a gain to the whole.

The interests, then, of both the consumer and the gas company will be best served by the use of appliances adapted to give "continued satisfactory service." Charged as we are, morally if not otherwise, to safeguard these interests, it behoves us to devote our energy towards the universal adoption of safe, well-constructed, and properly-used appliances in all fields of gas utilization.

"NEW" OR "DOUBLE" GAS FOR SMALL WORKS.

By C. B. Tully, of Hythe, Kent.

The following description of "'New' or 'Double' Gas for Small Works" was prepared by Mr. C. B. Tully in the form of a paper which he was to have read at the recent meeting in Dublin of the Irish Association of Gas Managers. He was, however, as already recorded, unfortunately unable to be present at the meeting; and so it was decided by the members that the paper should be left over until next year's meeting, when it was hoped the author would be able to attend and read it. But in view of the interest attaching to the subject, it has been thought that it would be a pity for the matter to remain unpublished for another twelve months; and so Mr. Tully has withdrawn from the Association the paper prepared for the last meeting. This has been placed at our disposal by Mr. Tully for re-production meanwhile as a "Communicated Article;" and he has promised to prepare another paper, bringing the information up to date, for next year's meeting of the Irish Association.

"New" or "Double" gas is the name given to the gas resulting from the complete gasification of coal and the generation of water gas from the resulting coke in one combined plant. This process can scarcely be called "new," as it has been carried on for some years with generators exactly similar to that advocated by Professor Strache in the "Gas World" of June 13. The first generator of this kind was erected at Sligo some ten years ago, and was followed by plants at Truro, Swindon, St. Mary Church, and several other works in England and on the Continent, and many others are now in course of construction.

It is usual practice with these plants, when a larger amount of diluting gas is required, to fill the upper or retort chamber of the generator with coal of a semi-caking quality, or a good coking cannel, or a mixture of coal and coke, with the result that a gas testing between 380 and 400 B.Th.U. is obtained. This generator was referred to by the author at one of the Irish Gas Association meetings many years ago. Descriptions and illustrations also appeared in the "Journal of Gas Lighting" of April 25 and May 2, 1905, and again on April 9, 1907, and in the "Gas World" of March 6, 1909. If reference is made to these articles, it will be seen that the plant is exactly similar to that described by Professor Strache.

Although coal is used in these plants when a rich gas is required, it is not the general practice to do so, as the real object in this country is to dispose of the coke and take it off the market. By this means a very much better price is obtained for it.

The conditions of the residuals (oil and benzol) markets have undergone several changes during the past ten years. At that time it was a question of the disposal of coke and tar, and enrichment with benzol. At the present time it is a question of the disposal of the coke or to restrict production of that article. As tar finds a ready market at 3d. per gallon, gas oil, even at its present price, is cheaper than tar for enrichment. Benzol, at 1s. 4d. per gallon, is much too expensive. There is no doubt the cheapest and best enricher is good coal gas. With a water-gas plant it is far better to carbonize at a low temperature, to produce rich gas, with a good useful coke, and to dilute with water gas to the required standard, and depend upon the coal gas enrichment alone. By far the best plan, however, is to dispense with enrichment altogether, and supply such gas as can be obtained from the complete gasification of the coal, without any residual coke—leaving only tar and ammonia as residuals. Even then, if it is advisable, the tar can be used up in the generator for the production of gas. This will dispose of the trouble and worry of the coke market, and be financially better for both consumers and shareholders.

The variation from time to time in the values of coke, oil, and benzol affects the economical utility of various carburetted and other water-gas plants in use. This has caused manufacturers of these plants to modify and alter their designs, with the result that there are plants now designed that will use any class of fuel or enricher and enable advantage to be taken of the cheapest at the time being on the market, and at the same time produce gas of equal quality.

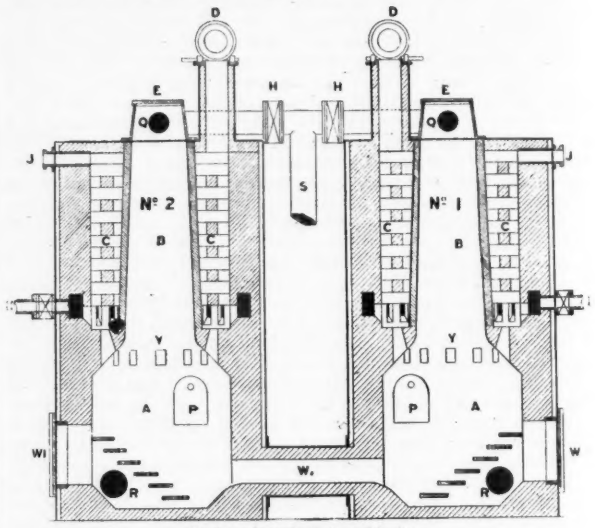
There are no doubt great possibilities for "Double" gas plants in small gas-works, where they can be economically and profitably used to produce all the gas required—substituting "Double" gas of 380 B.Th.U. for coal gas of about 550 B.Th.U.

The plant of this description most likely to meet all the requirements of small gas-works is the "twin generator" type, as illustrated, where the two fires are "blown" together and worked in series. The advantage of this type of plant is that when repairs are necessary to the generator—say, about every three years—one generator can be isolated and the other used for the time being for gas making. Minor repairs to the producer walls can be done at any time between the working hours.

The plant consists of two cylindrical wrought-iron shells, the bottom part fitted with producers and the upper with vertical retorts, surrounded by chequer brickwork; the two producers being connected at the base by means of a duct, to convey the gas from one to the other. These producers are "blown" similar to the Dellwik producer—that is to say, the fuel is "blown" to complete combustion through the nostrils at the proper height. Instead of the hot blast gases going to waste, as in the Dellwik producer, they are utilized to heat the chequer brickwork and to carbonize the coal in the retort in the upper part of the generator. The hot chequer brickwork in the annular space round the retorts is also used as a carburettor for oil, when required, and as a superheater for the steam, by which means steam of low pressure or wet steam can be used. A secondary air supply is provided to burn-off any combustible gases left in the blast gases, or combustible gas can be made purposely to heat the coal-gas retorts and burned in the regenerator, if required.

The chief advantages of this plant are short travel for the blast, quick heats, with less waste of fuel, long travel, and consequently longer contact of the steam with the incandescent fuel when making gas. The carbon dioxide left in the annular space or regenerator during the "blow" is swept out by the steam at the commencement of the "run," and converted to carbon monoxide in the producers, instead of being sent forward, to the detriment of the gas.

The whole of the rich coal gas is recovered from the coal in the retorts, as it is driven off by the heat from the baffle brickwork in the annular chamber as well as when distilled-out by the hot water gas when passing through the retorts.



Twin "Double" Gas Plant.

A. Producers. B. Coal Retorts. C. Regenerators. D. Stack Valves. E. Charging Doors. H. Gas Valves. J. Oil and Steam. P. Flue. Q. Gas Outlet. R. Blast. S. To Scrubbers. X. Air. W. Gas Duct. WI. Clinkering Doors. Y. Nostrils.

In this arrangement there are no hot valves to get out of order or cause trouble. The gas-making process being reversed, after each "blow," the steam is caused to travel through the regenerator, which, during the previous "run," was used for cracking-up the oil, with the result that the carbon deposit from the oil is scoured off, and used up for the production of water gas, while the brickwork is kept clean and in an efficient state. Before the end of the "run," the generators are both reversed for a minute or so, to sweep-out the oil gas from the regenerator chamber. The steam in passing through the regenerator, and before reaching the producers, is very highly superheated, and acquires still more heat in passing through the producers; but as this passes from one producer to the other without going under the fire-bars, the fire-bars are not in any way affected, nor is there an excessive production of clinker.

The fuel chamber is kept full to the top, and can be arranged with a hopper and valve to admit the necessary charge at every "run." In this way working is practically continuous, except for clinkering, which is a very simple operation with the step-grate. The coal gas generated in the retorts during the "blow" is drawn off through the gas outlet by having the gas-valve slightly open or by a bye-pass arrangement.

From the illustration the system of working can be plainly seen. The producers are "blown" to incandescence in parallel by means of the air-blast. Secondary air is introduced for the complete combustion of the producer gases, which pass away through the

nostrils, heating-up the chequer work in the annular space round the retorts, and away by the stack-valves, through which they escape to the chimney. The time for "blowing" is about one minute; the heat being quickly obtained, owing to the shallow bed of fuel. The coal gas generated during the "blow" is withdrawn from the top of the retorts through the gas-valves, which are partially opened for the purpose, and forced to the scrubber by the pressure of the blast.

The direction of the "run" or steam for gas making is reversed after each "blow"—that is to say, in one "run" the steam travels from the generator No. 1 to No. 2. The blast-valves and the secondary-air and stack valves are closed, and steam is admitted at the top of the chequer brick regenerator. The steam becomes superheated and passes down through the nostrils, and then through the fuel bed No. 1, and, by way of the gas duct, up through fuel bed No. 2, and through the valve X; the valve being opened sufficiently to carry off the coal gas generated in No. 1 retort. At the same time, if required, oil is admitted and cracked-up in the regenerator of No. 2; passing down through the nostrils and up retort No. 2, and away with the water gas and coal gas. After this "run," and when the fires have been "blown," the travel is reversed.

By this arrangement double the contact and double the travel are obtained for the steam through the incandescent fuel, and advantage of the shallow bed of fuel and the sharp "blast" as in the Dellwik plant is obtained, together with that of the deep fuel bed and longer contact with the incandescent fuel. Furthermore, the heat from the hot blast gases evolved during the "blow" is stored in the baffle brickwork of the regenerator chambers round the retorts, and used for superheating the steam and cracking-up the oil.

This arrangement, which ensures the most favourable results in the production of a gas having a small percentage of carbon dioxide, is, as a matter of fact, a blending together of three processes—the Dellwik with the shallow bed of fuel, the "K. & A." with its double gas generator system, and the "M.H." regenerator and retort chamber. It is a combination which will meet all requirements at the present time, and produce with the utmost economy "Double" gas, blue water gas, carburetted water gas, methane hydrogen gas, coal gas, or a mixed coal gas and producer gas of any quality, as necessity arises.

Costs of Working.

The economy of the "Double" gas as compared with ordinary coal gas is best shown by comparing the working of a small gas-works (5 million cubic feet) when supplying coal gas of 550 B.Th.U. at 6s. 3d. per 1000 cubic feet and when carbonizing coal for the production of "Double" gas of 380 B.Th.U.

Five Million Cubic Feet Works with a Capital of £3000.

Gas made . 4,777,400 cubic feet		
Sold . . . 4,136,900 ,, ...		£1,190
640,500 ,, (unaccounted-for gas)		
Residuals sold		110
Total receipts . .		£1,300
Coal	£591	
Salaries and wages	286	
Rent, rates, &c.	56	
Incidental expenses	45	
Purifying	20	
Repairs and maintenance of works . .	70	
Total expenditure		1,068
Profit . .		£232

Same Works Supplying "Double" Gas at 2s. 6d.

Gas sold (double the quantity) 8,273,800 cubic feet at 2s. 6d.		£1,034
Unaccounted for 640,500		
8,914,300 gas required		
Tar		29
Total receipts . . .		£1,063
Coal—297 tons at 21s.	£321	
Wages	286	
Rents, rates, &c.	56	
Incidental expenses	45	
Purifying	20	
Repairs and maintenance of works . .	70	
Total expenditure		789
Profit . .		£274

These figures are taken from the balance-sheet of a small gas-works, and for comparison the same items are taken in both cases, with the exception of coal, which in the case of "Double" gas will be considerably less, as will also be the case with labour and repairs and maintenance of works. At this works coal gas costs 4s. 6d. per 1000 cubic feet to manufacture and distribute, as against 1s. 9d. per 1000 cubic feet for "Double" gas—a difference of 2s. 9d. per 1000 cubic feet. As the unaccounted-for gas will be the same for "Double" gas as for coal gas, there must be a considerable saving under this head alone.

It will be seen that supplying "Double" gas at 2s. 6d. per 1000 cubic feet, the company will make an extra profit of £42, whereas the consumer will have 12,668 B.Th.U. for 1d. in the case of "Double" gas, against 8730 B.Th.U. with coal gas—an increase of about 45 per cent.

In arriving at these figures the very low yield of 30,000 cubic feet per ton of coal has been taken in the case of "Double" gas, whereas the average make for intermittent working is about 45,000 cubic feet, and for full work over 60,000 cubic feet are obtained. Allowance has to be made for the gas used for raising steam and stand-by fuel. The make varies with the size of the plant and hours of working per day.

Higher Toxicity of "Double" Gas.

The only objection that can be raised to the use of "Double" gas is its higher toxicity as compared with coal gas; but as many towns on the Continent are being supplied with similar gas, and, moreover, during the coal strike many gas-works were sending out carburetted water gas with quite the same proportion of carbon monoxide, without any accidents, there need be no cause for alarm.

The consumer will no doubt willingly take a supply of this gas, in place of coal gas, to save 45 per cent. of his gas bill.

"Double" gas will, no doubt, open a big field for the consumption of gas for heating and hot-water circulators, and will be a useful competitor with suction-gas plants. Arrangements are now being made to fit up some small gas-works for supplying "Double" gas independently for general purposes, which will be a pioneer movement of importance to the gas industry, and more especially to small struggling gas undertakings.

AMERICAN GAS INSTITUTE.

Subjects for the Forthcoming Annual Meeting.

The "American Gas Institute News" for the current month contains a new feature in the shape of abstracts of some of the papers to be submitted at the forthcoming annual meeting, which will be held in the Engineering Building, New York, in October. There is also an abstract of a report of a Committee on the "Measurement of Gas in Large Volumes," by the Chairman (Dr. J. F. Wing). All the papers are being printed in full in pamphlet form for distribution. Meanwhile the members will be able, from the abstracts (two of which we reproduce), to obtain a good idea of the nature of the communications to come before them.

MEASUREMENT OF GAS IN LARGE VOLUMES.

The different methods of measuring gas in large volumes may be divided into two classes: (1) Direct or positive methods, in which the gas displaces a known volume in a moving apparatus such as gasholders, wet drum and diaphragm meters, and calibrated exhausters; and (2) inferential methods, in which the total quantity of gas is subjected to various conditions, and the amount is inferred from some effect of heat, pressure, or impulse. This class comprises: Velocity meters, such as the Venturi meter, the Pitot tube, calibrated orifices, anemometers, rotary meters; proportional meters, in which a known fraction of the total volume is measured by direct methods; and calorimetric meters such as the electric type, in which the volume is ascertained by the electrically measured heat required to raise its temperature. All these meters may be set up and calibrated, and will then measure with commercial accuracy for a longer or shorter time; the degree of reliability depending upon the maintenance of stable conditions.

Gasholders.—Under favourable conditions of sun and temperature, these are accurate; but these conditions occur but seldom, and holders are in general suitable for rough work only. The small calibrated holder, however, is the standard by which all measuring devices are finally tested.

Wet Drum Station Meters.—For large volumes of gas, these are the most reliable appliances that we have. They measure positively gas of any gravity and within wide limits, of any temperature and pressure. Careful tests of three 16-feet drum Hinman meters three and five years after overhauling indicated errors of less than 1 per cent.—showing as great an accuracy as could be hoped for. After an uncertain term of service, some moving parts may give out—notably the drum by corrosion, or the falling-out of bolts or rivets. A leaky condition may be discovered by a stand-still test on each quarter of the drum. In other respects, wet meters are unsatisfactory. They are expensive, cumbersome, heavy, require a large space for installation and costly foundations, and are not flexible for overloads.

Diaphragm Meters.—These are not of a capacity to measure large volumes, owing to the nature of their construction. The largest one—a 500-light meter—is not good for more than 5500 cubic feet an hour.

Calibrated Exhausters.—Calibrated positive exhausters offer a direct method for the approximate measurement of gas. They are displacement meters, but lack the accuracy of a station meter because the gas compartments invariably leak. After running long enough to acquire an inside coating, it is, however, a better measurer than is generally supposed, and, if running well, is preferable to an inferential meter, and quite as accurate, once calibrated, as a Pitot tube or orifice meter.

Venturi Meters.—These are in the form of contracted sections of pipe inserted in the pipe-line, the differential pressure between the throat and the line conjunction with the areas of the meter and conditions of the gas affording a means for calculating the volume passed. The Venturi meter is very accurate if in good condition and with a considerable length of straight approach.

It is, however, handicapped by necessitating the use of a very complicated formula, though this objection is overcome by a direct-reading chart furnished with the meter. A 12 in. by 6 in. Venturi meter has been connected to the station meter of the Providence Gas Company for two years, and has shown a very satisfactory agreement. Readings taken on single days over a period of four months show an average discrepancy of 0·14 per cent. slow, although errors of 5 per cent. were noted. These, however, are ascribed to shutting-down and starting.

Pitot Tubes.—The simplicity of the Pitot tube makes it an attractive device, especially as it contains the possibility of accuracy. This device measures the velocity of flow by showing the velocity head caused by the impact of the current on a pressure-gauge, the arm of which is balanced by the static head in the pipe. The formula for measuring the flow is quite simple; but it is difficult to determine the differential pressure accurately, and the efficiency of the instrument is also uncertain. Therefore it can merely serve as a rough indicator, and may be wrong to the extent of 10 or 20 per cent. or more.

The Pitot tube requires the greatest care in its manipulation. The opening to the static pressure connection must not be influenced by the flow of the gas current, and in taking the readings the velocity opening must be placed at the point of average velocity, or else the area of the pipe must be explored and the average taken of the readings. The former is the customary method. Mr. W. C. Rowse, in the laboratories of the University of Wisconsin, concluded that, when all determinations were made with the utmost refinement, the Pitot tube is correct to within 1 per cent. The static pressure should be obtained by a hole 1-50th inch in diameter in a perfectly smooth surface; and the tube should be preceded by a run of straight pipe of which the length is 20 to 38 diameters. For measuring differentials too small for the ordinary gauge, U gauges using water and a liquid of a specific gravity near that of water, or else U-gauges with one leg inclined, may be used.

Calibrating Orifices.—This method is extremely crude, and has, moreover, the drawback of throwing back-pressure, though it is fairly satisfactory for certain purposes, as for measuring the air from a blower to a water-gas apparatus. This has the advantage over the Pitot tube that both pressures are taken as static. A related method of measuring gas is by the loss of pressure by the flow through pipes, using Pole's formula.

Rotary Meters.—The anemometer is a device which registers the impact upon moving vanes, and so indicates the velocity of flow. This is delicate in construction, and liable to respond differently to the current at different times. Again, the velocity of the gas varies in different parts of the conduit, so that the indications are very uncertain. The rotary meter is built on the plan of the anemometer, but is far more reliable, and, when accurately calibrated and in good order, is a serious competitor of the station meter, having the advantages in both convenience and cost. Its mechanism, however, is delicate, and the passages may become partially clogged by deposit from the gas, causing it to register incorrectly. Experience on the whole, however, has been very satisfactory, but careful control and inspection are necessary.

Proportional Meters.—In the proportional meter only a fractional part of the gas is measured, and from this amount the total volume is determined. The mechanism is designed to maintain a constant ratio between the measured and the unmeasured volumes. The Wylie and the Westinghouse proportional meters are examples of this type, both of which are employed extensively for the measurement of natural gas; while the former is used in several works as a station meter to measure artificial gas. Proportional meters should not be used where the flow of gas is pulsating, and there should be at least 5 or 6 feet of straight pipe at the inlet and outlet, to avoid eddies.

Calorimetric Meters.—The electric gas-meter invented by Professor C. C. Thomas is of this type. Its action is as follows: The specific heat of 1000 cubic feet of illuminating gas is very close to 21 B.Th.U. The gas is heated by an electric heater by a constant amount—say, 2°; the heating being controlled by an electric thermostat. The energy required being measured very exactly, the amount of gas passing may be determined. This meter is very much more complicated than any of the others, and requires much more attention than is given to a station meter. One seemingly objectionable feature where naphthalene is present is a liability for the heater to clog-up. The meters may be built of any capacity, and there is one in Milwaukee rated at 3 million cubic feet per hour. The usual range of the meters is 15 : 1; but by using a second resistance it may be made 60 : 1. The meters have been regarded as reliable by several experimenters, and are winning especial favour in the natural-gas field.

General.—The following table of approximate comparative costs of meters of capacities of 250,000 cubic feet per hour suggests the question as to whether an inferential meter may not sufficiently fulfil the requirements: Wet station meter, 100; rotary meter, 50; electric meter, 38; proportional meter, 30; Venturi meter, 12; Pitot tube, ½. The cost of a 500-light diaphragm meter passing 5500 cubic feet per hour is $275, and its cost compared with the largest station meter is 1 : 33, while the capacities are 1 : 45.

Correction should be made for the pressure under which a meter works as well as for temperature, as ignoring this may lead to errors of more than 3 per cent. Such a correction would tend to increase the unaccounted-for gas, but would give a truer view of the operation. This refers to displacement meters only. The electric meter makes all these corrections automatically, except that for the varying amount of water vapour at different temperatures, which may be ignored. Velocity meters, such as the Venturi meters, Pitot tubes, calibrated orifices, and rotary meters, also depend upon a knowledge of the temperature and pressure, as well as of specific gravity.

The following is an abstract of a paper for the Distribution Section of the Institute by Mr. R. B. Duncan, of Philadelphia.

INSTALLATION AND MAINTENANCE OF SERVICES.

The present tendency is to put in much larger pipe than was formerly the practice; in many towns 1¼-inch being the minimum size for services less than 100 feet in length. Schedules of sizes are made out for various types of buildings. Where these do not apply, the size must be calculated; liberal allowance being made for new developments in gas appliances. Where runs are short, as in large cities, services should not be laid in advance of paving or of building operations.

In Philadelphia, the rule is one service in each house, except where a building is at the back of another on the same lot, or where a number of small houses face a footway, forming an alley. The general practice of running one service to two houses is strongly condemned. In Philadelphia, services are usually laid to new houses during construction, and a sleeve, consisting of a piece of stove-pipe, is furnished the builders to set in the wall to accommodate the service-pipe, with suggestions as to its location. Care should be taken to lay the service far enough from the water and sewer trench to prevent settlement of the gas-pipe.

The depth of the pipe is fixed by the depth of the main; but the covering should be not much less than 15 inches under the roadway on account of danger of breaking by traffic and of freezing in severe weather, and also to protect the service from cinders which often form the foundation of concrete sidewalks. Where service drips must be installed, they should be located outside the house. Where some structure, as a conduit, interferes with the grade, the service may be run over it, with a branch underneath, the whole encircling the obstruction.

Except where required by law it is not customary to instal kerb cocks on services smaller than 2 inches. In Philadelphia, a valve is used on services of 2½ inches and larger. Stop-boxes should be extensible, and their bases should allow ample room to clear the dirt from around the cock.

The consensus of opinion is that modern steel pipe, particularly if "Spellerized," is as durable as wrought iron, and is besides cheaper, stronger, more ductile, and more uniform in composition. Galvanized pipe is beginning to be employed, and the writer believes with economy. Cast iron is used for services of 4 inches and upwards; connection to the main being made by a hat flange, split hub, or branch, according to the size of the main. The cast iron should continue to 3 or 4 feet from the cellar wall, after which the pipe should be of steel.

The cost of coating the pipe with a preservative is so small that, even in the absence of knowledge as to the extra life obtained thereby, the expenditure is justifiable. Many carbon and asphaltum paints are on the market; but convincing tests are lacking. The material now used in Philadelphia is that known as the Hickenlooper coating, as described in the "Proceedings" of the American Gas Light Association. From examinations of pipes coated with this mixture, and laid in good soil, it is believed that services will last from twenty to thirty years, and perhaps longer. In bad ground, the pipe should be laid in a box filled with cement or pitch. The standard blocking in Philadelphia is 8 in. by 8 in. by 1 in. It has been found that untreated wood holds moisture enough to produce a marked increase in corrosion at the point of contact with the pipe, and creosoted blocks are therefore used.

The various tools for service and leak work are described and illustrated in the paper, especial attention being paid to the die, which, unless properly designed, will be entirely unsatisfactory. For night leak work, a home-made electric lamp equipment is used in Philadelphia, supplied by six dry cells, and giving a light of six candles for 18 hours. For work in cellars and manholes, an electric hand torch is employed. Where men have to work in gaseous atmospheres, a respirator consisting of a mouthpiece strapped over the head is employed, in connection with a hand bellows. Kits for the treatment of asphyxiated men should also be carried in every service-cart.

In small towns the work may be ordinarily supervised by a general street foreman, who will be able to make all inspections, order materials, fill work orders, act as timekeeper, &c. In large cities it is generally advisable to divide the territory into districts of the same area. In congested districts the general service foreman will not have time to attend to the details of the work, but must leave this to the inspector, who will take charge of from four to six gangs. The duties of the latter are usually similar to those of the general foreman in small towns. Owing to the number of underground structures and traffic congestion, a large service gang is uneconomical, and one consisting of foreman, handy man, and two labourers is about the best. In the scattered suburban districts, the work is very similar to that in small towns, and consists largely in repetition of routine jobs. In this case it is well to have service-carts, fully equipped, located permanently in each isolated section, to serve as a depôt of supplies. An ample stock should be kept of all materials used, and its collection and delivery should be according to an invariable programme.

Before the installation of services, the progress in construction of new buildings should be watched, so that the service may be

run under the best and most economical conditions. Where large building operations are in progress, it is more economical to deliver material direct from the central store-room.

Where there is no rock, the only problem in trenching is to get the greatest amount of work from each individual digger; a good way being to have the gang foreman set the pace at increased pay. There is a growing tendency to prohibit tunnelling; but in service work the refilling may be generally done well enough to prevent settlement. In some cases drilling is advisable, but this is difficult, and not always satisfactory.

Pipe of 2 inches and less is generally cut on the job, though conditions may arise where it is profitable to cut it in the shop where power is available.

A schedule is given of the size of the tap for different sizes of services and mains, and for the use of sleeves on small mains. The standard swing connection at the main, consisting of service tee and service ell, is preferred to the single ell or straight connection into the side of the main.

Before laying, care should be taken to see that the pipe is free from obstructions, and that the threads are clean. White or red lead are the favourite jointing material, though cement and oil are used in Philadelphia. The stopcock, if one is used, should be inspected to see that the plug is free. If it is necessary to offset the line, 45° ells are preferable to right-angled ones. If it is not possible to lay the pipe directly on undisturbed earth, wooden blocks are used at the stopcock, under each joint, and at intervals of not more than 6 feet. After turning on the gas, the pipe should be tested by soapsuds under the supervision of the service foreman. In refilling, it is of the utmost importance to leave the surface so that there shall be no settlement, and the hole by which the service passes through the wall should be carefully closed.

In general, service records are not so essential as main records; but they may be made a valuable adjunct to the distribution office in repair work, location of underground structures, settlement of claims, and in connection with orders to set meters.

The organization for maintenance is practically the same as for new work. The force should be kept practically intact in winter, as a radical laying-off of men brings about a liability of facing a serious leak situation with an untrained force. The line-walking force should consist of a chief line-walker, with enough men to cover the distribution system at intervals short enough to render improbable, with proper routing, any serious damage occurring by accident to mains or services. In severely cold weather, it is advisable to increase the force in order that small mains may be patrolled oftener, and even at night, if occasion seems to demand. When a foreign concern is doing extensive work tending to endanger the gas company's structures, a man is stationed permanently on the job. The line-walkers also record excavations made exposing the gas-mains with a view to the completion of the office records; and besides this they are instructed to see that the work done by the company is left in safe condition.

A leak order takes precedence over everything else. If the leak is in a building, this should be entered by any reasonable means and properly ventilated; all occupants being forced to leave, and all lights extinguished if necessary. If the leak is in the street, it is then to be located as nearly as possible by examining for smell at the front cellar wall, particularly where the gas, water, and drain pipes come through, at manholes and kerb boxes, and then by baring. A leak between the kerb box and meter may be detected by closing the stopcock and noting a cessation of the smell or loss in pressure.

The cause of insufficient pressure should first be localized by lighting burners on the line, use of a pressure-gauge, or removing a cap or plug. The nature of the stoppage will be indicated by the presence or absence of the pulsations characteristic of a trapped pipe containing condensation. A stoppage due to liquid is readily removed by the force-pump if the service is not too long or of too great diameter. If this does not clear the obstruction, digging will be necessary. Solid obstructions must be poked out with a wire, followed up by the force-pump; and freeze-ups are cleared by wood-alcohol, hot brine, &c., though, in extreme cases, digging must be resorted to.

Direct Recovery of Ammonia as Sulphate without Distillation.

Herr W. Strommenger, in "Stahl und Eisen" [Vol. XLI., p. 1694], has an article on this subject. For removing tar from hot gases previous to the direct recovery of ammonia as sulphate, he describes a scrubber composed of two superposed chambers containing washing tar up to the level of an overflow. The gases are brought to the desired temperature by means of a spray of ammonia liquor, and admitted to a number of inverted troughs immersed in the tar, and having serrated lower edges. Two perforated plates are also immersed in the tar to insure intimate contact between the gases and the tar. The gases pass first through the lower and then through the upper chamber; and in the latter there is a filter above the tar-level, to retain any tar spray. The washing tar is renewed by the tar separated from the gas, and the surplus runs continuously from the overflows. This apparatus has been in use for some time in connection with 120 coke-ovens at Ruhrort. No tar could be detected in the gases leaving the scrubber, and the quantity of ammonia in the gases leaving the saturator was only 0·75 gramme per 100 cubic metres. The ammonium sulphate was of a good, gray colour, and contained 25 per cent. of ammonia on leaving the hydro-extractor.

OVERCOMING VIBRATION IN GAS-FITTING.

The "Bulletin" of the American Commercial Gas Association for the current month contains an article on the "Installation of Incandescent Gas-Lamps on Pipe-Lines Subjected to Severe Vibration." The author is Mr. ROBERT FFRENCH PIERCE, of Gloucester (N.J.), and he offers the following observations upon the subject.

While the art of gas-mantle manufacture has been developed to such a degree that the inherent fragility of the mantle has been sufficiently reduced for nearly all commercial purposes, and shortening of mantle life from this source is practically negligible with the best grades of mantles, there are classes of work which require a certain amount of care in the arrangement of piping in order to entirely eliminate vibration troubles. The additional cost of installing piping in the necessary manner is generally negligible, and such installation is invariably more satisfactory and economical than the alternative—the use of extremely heavy mantles of low efficiency (and heavy mantles are not necessarily strong).

In order to reduce the effects of vibration upon mantles, it is necessary to reduce the frequency of vibration, as the suddenness of the shock on the mantle is lessened. This will be appreciated by considering the smoothness with which a slowly vibrating weight rides upon a very flexible spring as compared with the violent movement of a small weight upon a stiff spring.

The pipe supporting the lamp may be regarded as a weighted spring, which, when set in motion, tends to assume a definite natural frequency of vibration, and to damp-out frequencies of a higher order. It is therefore desirable to make the natural period of vibration as great as practicable.

The natural frequency of vibration of a weight supported by a spring is—

$$f = 0{\cdot}2862\sqrt{\frac{S}{W}} \text{ or } f^2 = 0{\cdot}0762\,\frac{S}{W}$$

where f is the frequency of vibration, S the stiffness of the spring, and W the weight at the end of the spring. Thus the frequency of vibration of the lamp, and the violence of the shock upon the mantle, may be decreased either by weighting the end of the pipe nearest the burner, or by decreasing the stiffness of the pipe, or both.

The stiffness of a pipe acting as a straight spring is,

$$\frac{3\,E\,I}{l^3}$$

Where E = modulus of elasticity of the material
I = moment of inertia of section = $0{\cdot}049\,(D^4 - d^4)$
Where D = outside diameter
d = inside diameter
l = length.

In installing individual lamps, only three pipe sizes—$\frac{1}{8}$ inch, $\frac{1}{4}$ inch, and $\frac{3}{8}$ inch—need be considered. The last-named size of pipe is about four times as stiff as $\frac{1}{8}$-inch pipe for a given length, and about one-and-a-half times as stiff as $\frac{1}{4}$-inch; so that, in practice, the greatest decrease in stiffness obtainable by changing pipe sizes is about four times. Doubling the length of a pipe of given size will, however, decrease the stiffness eight times, or to one-eighth the former value. The additional free pipe length may be either straight, in the form of a coil, or an open loop. The choice of methods depends entirely upon the available room. If $\frac{1}{8}$-inch or $\frac{1}{4}$-inch pipe is used, a free length of 24 inches is generally sufficient, with the free end properly weighted, to absorb the most violent vibration apt to be met with in practice. If $\frac{3}{8}$-inch pipe is used, a coil may be required. The coil should be as close to the fixed end of the pipe as possible.

On account of the lengthwise rigidity of gas-pipe, it is usually desirable, where the vibration in an up-and-down direction is considerable, to use a loop or coil of pipe, which should be as close to the fixed end of the pipe as possible. It is frequently found that placing the loop at right angles to the pipe-line gives better results than in the same plane. By forming the pipe so as to give great elasticity in all directions, and by proper weighting, any reasonable degree of vibration may be absorbed.

On existing pipe-lines, the effects of vibration may often be sufficiently reduced by weighting the free end of the brackets and pipe-drops. If this does not suffice, anti-vibration coils may be installed, together with suitable weights on the free end of the pipe. It will usually be more economical, however, to replace existing pipe-drops and brackets by others of proper design and properly weighted, as these may be made up at negligible cost on the ground, and are just as effective as the more expensive anti-vibration coils and fixtures.

Wherever piping is run where considerable vibration is expected, avoid, as far as possible, anchoring piping to structural members which might be expected to transmit the most violent vibrations—such as floor-beams, columns supporting crane runways, and members supporting shaft-hangers. In other words, interpose the greatest practicable distance between piping and points where the most violent vibration occurs.

The intelligent application of the principles already mentioned will result in the elimination, at a negligible expense, of any but extraordinarily violent vibrations to such an extent as to permit the use of regular high-efficiency mantles without excessive breakage from vibration shocks.

ECONOMICAL STREET LIGHTING.

By Malcolm Littlejohn, M.A., B.Sc., of Glasgow.

[A Paper read before the Irish Association of Gas Managers, Aug. 11.]

In this paper I am going to propound a few of the problems that present themselves to those engaged in the lighting of streets; and while attempting to show how the solutions may be arrived at, I am going to tell you what we in Glasgow consider to be the practical solutions of the problems.

The Illumination Needed.

To begin with, we must know exactly the illumination we are setting ourselves to obtain. In the matter of the minimum illumination necessary, and the method of measuring it, it seems to me the height of folly (which, fortunately, is only confined to the makers of lamps and measuring instruments) to try and lay down any hard-and-fast rules. Local circumstances must decide in each case what illumination is necessary. There are some general considerations, however, which apply all round.

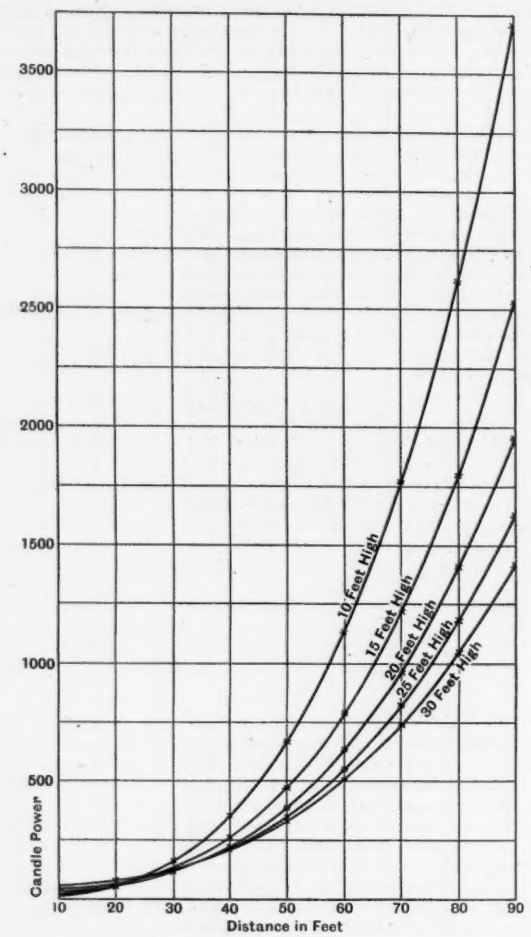


Diagram 1.—Showing the Candle-Power of Lamps at Different Heights necessary to Give a Minimum Illumination of 0·1 Foot-Candle at Various Distances.

It is not economical to light up more than is absolutely necessary. We want the roadway and footpath properly lit; but we do not want any light to go upwards. In some cases we may not want any light to go in one direction. Thus we need a proper reflector to go above our light, and perhaps behind our light.

Assuming ourselves in possession of the proper design of lamp, we have to decide—

(1) What candle power we will use.
(2) What distance apart we will put the lamps.
(3) What height we will put them.

In considering these questions we must not forget that as even a distribution as possible should be aimed at, and the lights must be high enough not to be an annoyance to the users of the road. For ordinary lamps (low-pressure low candle power) the height used in Glasgow is 10 feet above the roadway; and the distance betweeen lamps is 40 to 50 yards on each side of the street, according to the importance of the street. That is to say, in our average city street the distance between lamps measured across the street is about 24 yards. This gives us a ratio of maximum to minimum horizontal illumination of 26 to 1. While this difference seems to be very large, it does not offend the eye as might be expected.

The reason probably is that the maximum intensity is not great enough to cause the eye to be strained. In one of the photographs the lamps are from 40 to 50 yards apart, of 3000 candle power, and 16 to 18 feet high. The shadow between the lamps appears very pronounced; and the whole effect is displeasing to the eye. Yet here the ratio of maximum to minimum is only 20 to 1. Another photograph shows a street lit by 3000 candle power lamps; but the distance is 40 yards and the lamps are 25 feet high. The ratio of maximum to minimum here is 9 to 1; and the lighting appears to be very uniform. Here we have a practical illustration of the fact that the higher the candle power used the smaller must be the ratio of maximum to minimum illumination, in order not to offend the eye. It also shows that for good lighting the higher the candle power used the greater the height to which it must be taken. This is quite a well-known fact; and probably most of you have experienced it one way or another. It is the lowness of the lamp which causes one, on approaching a lamp, to fail to recognize the features of people one meets.

Height of Posts and Distance Apart.

Reverting to the questions of height and distance, I have here a diagram (No. 1) showing how, for a given minimum illumination (say, 0·1 foot-candle) and a given height of lamp, the candle power of the lamp varies with the distance apart of the lamps. From the curves you will see that the closer the lamps the smaller the candle power required to produce the same minimum illumination; and as the candle power is proportionate to the gas consumed, the closer the lamps the less gas will be consumed, not only per lamp, but per street. For example, in a street a mile long we would require 89 lamps, at 20 yards apart, of 117 candle power, each consuming 5·85 cubic feet of gas per hour—a total of 520 cubic feet per hour; or 59 lamps, at 30 yards apart, of 300-candle power, each consuming 15 cubic feet of gas per hour—a total of 885 cubic feet per hour; or 45 lamps, at 40 yards apart, of 632 candle power, each consuming 31·6 cubic feet of gas per hour—a total of 1422 cubic feet per hour; or 30 lamps, at 60 yards apart, of 1959 candle power, each consuming 97·95 cubic feet of gas per hour—a total of 2938 cubic feet per hour.

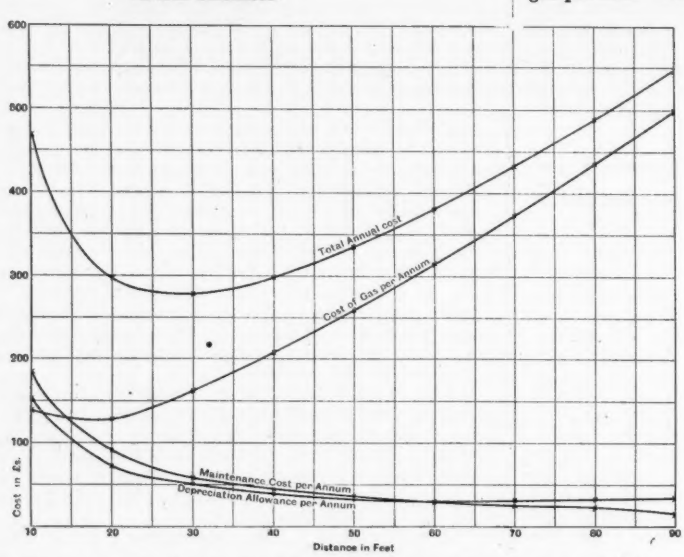


Diagram 2.—Showing the Cost of Gas, Maintenance, Depreciation, and Total Annual Cost of Lighting a Street 2000 Yards Long with a Varying Number of Lamps, placed 20 feet High.

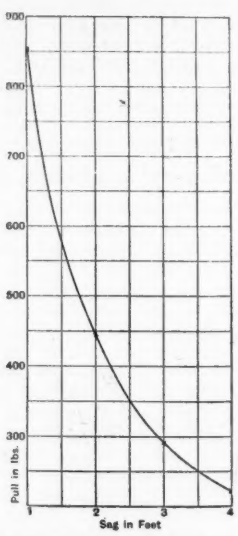


Diagram 3.—Showing Strain on 60 Feet Span with Lamp Suspended 15 Feet from One Side, at Various Sags.

Cost of Lighting.

This is the first part of the story. The rest of the story would be short if the price of the gas were the only consideration. For having measured the length of the street or streets to be lit, we would draw a curve similar to the "Cost of Gas" curve in the next diagram, and find the number of lamps which would give the smallest consumption of gas.

First of all there are the mantles to consider. If we fix on the candle power of our lamp from a consideration similar to above, we would probably find that we would require an odd size of mantle, which we would have to get made specially for ourselves, as is actually done in Glasgow. This is only possible in a large town; and, therefore, if we belong to a humble, unpretentious country town, we must needs take the ordinary size of mantles on the market. We are, therefore, limited in our choice of the candle power of our lamps. The upkeep of the mantles is a large item, and we have to consider how far we can deviate from uniformity so as to get as few mantles in as possible. And, at the same time, we have to consider the initial outlays. Thus we have to consider that—

(1) The closer the lamps, up to a certain point, the less gas is required for a given illumination.

(2) The closer the lamps the greater is the initial expenditure and the cost of maintenance.

Diagram No. 2 shows: (1) The cost of gas for lighting a street 2000 yards in length with different numbers of lamps. (2) The maintenance charges. (3) The depreciation. Adding the ordinates of these three curves together, we get the resultant curve which I have marked "Total Annual Cost." This curve comes down and then rises—the lowest point giving us the most economical number of lamps to use under the circumstances. Since the cost at any place varies with the price of gas, the price of labour, and the price of material, a separate set of curves would have to be drawn out for each place; and it would be found that what is best in one place is not so in another. We would probably find that the curve gives us a candle power for which we would require special lamps. This, of course, would be needless expense, and would alter the conditions so as to make things anything but economical. What we want is to get a standard size of lamp of a candle power as near as possible to the candle power we have found necessary.

Glasgow Street Lighting.

As I said before, in Glasgow the average distance between the lamps on one side of a street is 40 yards—giving us, with streets 40 feet wide, an average distance of 24 yards between one lamp and the next across the street.

We have four different sizes of low-pressure burners—viz.: (1) Bijou size, burning 1¼ cubic feet per hour, and reckoned as 25-candle power. (2) Medium size, burning 2 cubic feet per hour and reckoned as of 40-candle power. (3) Ordinary size, burning, 2·8 cubic feet per hour, with a candle power of 56. (4) Two-light, burning 5·6 cubic feet per hour, with a candle power of 110.

These are all inverted burners, and are used according to the importance of the street. For crossings we have a three-light burner burning 8·4 cubic feet per hour, with a candle power of 160. All these are inverted burners; and the same mantles are used for two-light and three-light as are used for the ordinary single-light burners burning 2·8 cubic feet. This prevents the multiplication of sizes, and consequent liability to mistakes. The mantle, as I said before, is made specially for us—being smaller than the ordinary size of mantles on the market, which require 3½ cubic feet of gas per hour for proper incandescence.

The bijou, medium, and ordinary are all swan-neck burners. The peculiarities are:

(1) There is no gas adjustment.

(2) There is no air adjustment.

(3) The nozzle is made for taking a mantle-ring with two lugs (inside or outside) instead of the usual three.

POLLOKSHAWS ROAD, GLASGOW, LIGHTED BY LOW-PRESSURE GAS IN TWO-LIGHT INVERTED BURNERS, CONSUMING 5·6 CUBIC FEET PER HOUR.

BATH STREET, GLASGOW, LIGHTED BY THREE-LIGHT THREE THOUSAND CANDLE POWER HIGH-PRESSURE LAMPS, FORTY TO FIFTY YARDS APART AND STAGGERED, SUSPENDED 18 FEET ABOVE THE ROADWAY.

The complete burner is the result of long years of experiment, in which the aim was to find out the proper diameter of nozzle to give the best flame and the proper diameter of injector to give just sufficient air for proper combustion. That we have got this is, I think, proved when you consider that we require no air adjustment. But a more striking proof is to be seen when the burner is fitted with the type of anti-vibrator used in Glasgow. Here, even although the air passage is as large as it can be, the efficiency of the burner is not the least bit impaired. If any of you try this anti-vibrator and do not find it a success, do not blame the anti-vibrator—just blame the burner or the fitting, as unless properly made and properly fitted it is worse than useless. Few of you, however, are probably troubled with excessive breakage of mantles due to very heavy street traffic. It was the heavy street traffic that induced us to adopt the two-lug mantle ring, the swinging motion of which prevents the mantle being jarred to the same extent as if rigidly suspended by three lugs.

The lighting of Glasgow is in the hands of an Inspector of Lighting, who is responsible to a Sub-Committee formed from the Watching and Lighting Committee. We are only, so to speak, consumers of gas, for which we pay the Gas Department 1s. 6d.

HOPE STREET, GLASGOW, LIGHTED BY LOW-PRESSURE GAS.
CONSUMPTION 5·6 CUBIC FEET PER HOUR.

per 1000 cubic feet. In order that we may not use more gas than we pay for, the Gas Department insist on us using volumetric governors (which they supply) on every burner. These governors are designed to pass the proper amount of gas at all ordinary pressures above 20-10ths. They are really marvellous pieces of workmanship.

The burners are fitted in square copper lanterns, with porcelain reflectors. The square lantern is adopted because it is the most economical to work with. It is made of copper, as tinned-iron does not last any length of time in the corrosive atmosphere of Glasgow. It is important that the reflector, if made of porcelain, should have a leadless glaze, as if not, it tarnishes through time, and cannot be cleaned. Only a few firms work with an entirely leadless glaze; and we are fortunate in having one of these firms in Glasgow. The lamps are carried on pillars of very plain yet effective design, which are batted into large square stones. It is only where heavier lamps have to be carried at a greater height that root pillars are used.

Lighting for Main Thoroughfares.

The lighting which I have told you of is all very well for streets where the traffic is comparatively small. In every town, however, there are one or two main thoroughfares which, owing to the amount of traffic, require special treatment—at least for the earlier part of the night, if not for the whole night. Up to about three years ago these streets in Glasgow were lit by electricity, because reliable and economical gas-lamps could not be obtained to give the requisite candle power. We have, however, recently turned our attention to high-pressure gas, and we have had one of our busiest streets lit by high-pressure gas-lamps. The lamps are three-light 3000-candle power, working at a pressure of 84 inches. They are suspended about 25 feet high, and one-fourth of the breadth of the street from the walls of the buildings, alternately on either side. The distances between the lamps, measured along the street, are approximately 40 yards. This gives a very even distribution of light. Two kinds of lamps have been used in the street—viz., Pharos-Welsbach and Graetzin; and we have sample lamps from other makers, which we intend to submit to exhaustive tests to find which are the best—the best being the one which gives the highest illumination per cubic foot of gas consumed for the smallest maintenance charge. So far we have nothing to communicate on this part of the subject.

As to the erection of the suspension gear, the wire which carries all the weight is a ½-inch all-steel galvanized wire with a breaking load of 4½ tons. It is attached to rosettes held in the wall by two bolts. The spans which we have erected in Glasgow are 60 feet and over; and the lamps weigh about 80 lbs. In diagram 3 is a curve showing the variation in the pull there is on the wire with the sag. As the pull is very considerable, it is essential that the rosette should be properly fixed to the wall. The usual way is to use molten lead, and we tried this for one span. In the case of one of the bolts the lead solidified too quickly—only entering the hole for about 2 inches. When the strain of the lamp went on, this bolt came away, bringing part of the face of the stone with it. We therefore decided to try lead wool or lead shavings; and to satisfy ourselves we made a test of three bolts in a stone—one with run-lead and caulked, one with lead wool, and one with "Ribbonite" (lead shavings). On splitting the stone the superiority of the wool and shavings over the run-lead was very apparent. At the present time we are putting up rosettes with tapered bolts and wedges; and all they require is a carefully-cut hole. The stronger the pull the tighter they wedge themselves. This is probably the best and cheapest method, as once the hole is cut the work is over—there being no use of molten lead at the top of a 35-foot ladder, with its attendant dangers, nor any caulking at a dangerous height. The lamps are traversed and lowered by means of gearing supplied by the London Electric Firm; and, so far, the gear has proved very efficient.

The lamps were all adjusted before being erected; and it was found that, to have the mantles fully incandescent, required 65 cubic feet of gas at 3 inches pressure—that is to say, 22⅓ cubic feet of gas per burner. The makers might probably say that the lamp was consuming 54 cubic feet of gas, conveniently forgetting to add that the 54 cubic feet is measured at 84 inches pressure, and not at 3 inches pressure. Thus they say the lamp is 1000-candle power if they get 1000 candle power from it in any one direction. This, of course, is absurd, as that direction may be the one in which the highest candle power is least required. The candle power claimed for any lamp ought to be the mean hemispherical candle power.

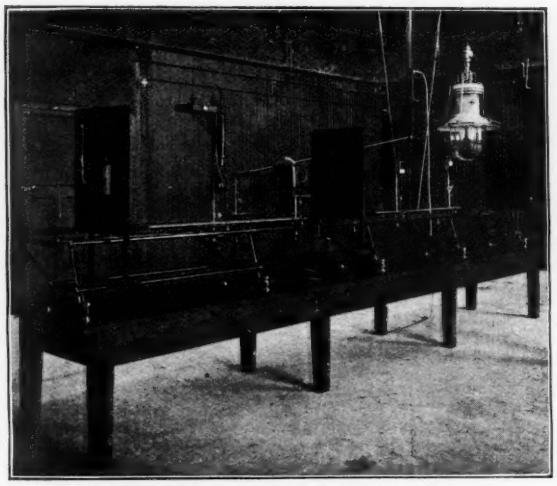
Equipping the Lighting Department.

Coming, now, to the equipment of a lighting department, it is surprising how large an equipment is necessary. First of all, we have the lighting, extinguishing, and cleaning of lamps, which means lamplighters. Then we require inspectors to see that the work is done properly, and to see that broken mantles are renewed, &c. Under a proper card system the number of mantles used in each lamp is noted; and from this we know if a new burner is extravagant on mantles, or if the strength of some new mantle is below the average. All this means clerical work, which means a staff of clerks. But before we can light our lamps we must erect them. We therefore require an outside staff of fitters to erect the lamp pillars, &c. As most of the pillars are anchored to stones, it is necessary to have one stonemason among the fitters; and as his whole time cannot be employed in mason work,

GREAT WESTERN ROAD, GLASGOW, LIGHTED BY LOW-PRESSURE GAS.

he must be able to do ordinary fitting when required. A good handy blacksmith is also necessary. It is hardly to be expected that the fitters will always be required for erecting. In Glasgow, we have always a fair number of accidents—lamp pillars being knocked down and lanterns smashed, &c.—to keep them busy. Our fitters also do the changing of burners, and replacing dirty ones by new or repaired ones. In a small place the fitter could always be kept at work cleaning burners. The lanterns which are used require a fair amount of repair; and this needs a tinsmith. In a small place this tinsmith might require to do the fitter's work as well. In Glasgow, however, we manage to keep about a dozen tinsmiths regularly employed. When not busy with repairs, they make up new lanterns. For the most part, however, the supplying of new lanterns is let out to contract. As each department is more or less dependent on the other, it would be very confusing if each got its material supplied separately. It is therefore necessary to have a Stores Department, with someone in charge responsible for all material and goods received and given out.

These are the necessaries of a lighting department; and the size of each depends upon the size of the town to which it belongs. If the town is large, and can afford luxuries, it can indulge in a Testing Department. This department is responsible for all burners which go out into the street, that they are properly adjusted, that they burn with a good flame, and consume neither too much nor too little gas. This is a tall order in a big city; and its importance is at once recognized when we consider that one-tenth of a cubic foot of gas per hour per burner means 360 cubic feet per year. Therefore 1000 burners burning one-tenth of a cubic foot per hour more than is necessary would means a waste of 3,600,000 cubic feet per year, which, at 1s. 6d. per 1000, means £270 per year. We can therefore have some idea of what the Testing Department in Glasgow saves in the course of a year, when we consider that there are 26,500 burners in the streets.



Street-Lamp Testing Photometer at the Glasgow Corporation Lighting Department.

The work of the department does not stop here. Each mantle maker has different prices for his mantles; and every maker makes better mantles than his neighbour. In Glasgow we buy mantles by the hundred gross; and it is essential that we should get the best that is going and know what we are getting. A mantle may be lower in price than others, but it may give a poorer light or a shorter life. All our mantles are subjected to two tests—one for illumination and the other for strength; and in placing our orders we go on our own tests and not on what the makers claim.

Further, there is an everlasting round of so-called improvements being put on the market; and as it is the duty of lighting authorities to progress, some of these improvements must be tried. Here, again, a testing department pays its way. The apparatus, whatever it may be, can be tried in the test-room, and if the results are good, a trial on a larger scale can be made in the streets. If the results are not good, the matter can be dropped without further expense.

DISCUSSION.

Mr. J. Paterson (Waterford) said they were all indebted to Mr. Littlejohn, for the subject he had dealt with was one they had all more or less to do with in their daily routine. To his own mind, public lighting by gas was not carried out so efficiently as it deserved. The heading of the paper "Economical Street Lighting" was certainly correct—judging by the size of the burners, which went down to as small as bijou. But he doubted whether it would be as efficient as they would like to see it. Often had it been said that their public lighting should be to a very large extent an advertisement for the gas undertakings; and, speaking in a general sense, he did think that gas-lighted streets did not do them credit. They were some of them too much on the side of economizing gas, and having the units too small. Usually, when gas was displaced by electric lighting, they got the ordinary single burners replaced by enormous units, such as electric or flame arcs. The man in the street, comparing the one with the other, said: "That fairly puts gas in the shade." Of course, if they had a 50-candle gas-lamp, and it was compared with a nominal 2000 or 3000 candle power electric lamp, it stood to reason that it was bound to be put in the shade. Therefore, while the gas lighting of the streets of Glasgow might be economical, it did not necessarily follow that it was as efficient as might be desirable. After all, if the authorities could afford large electric lamps, why could they not afford to have somewhat larger units for gas? His own experience of Scottish towns was that they did err in underlighting streets. He remembered that when flat-flame burners were in use the 2-feet burner was the standard. Then they went a step farther, and replaced ordinary 2-feet burners with bijou burners. Now, what kind of public lighting could they have with bijou burners of a nominal power of 25 candles? Gas did not cost much to produce. It did not cost any undertaking 1s. 6d. per 1000 cubic feet to produce. In fact, a much lower figure would represent it; so that a few cubic feet would not make a great difference in the finances of the department. It would be in the interests of the gas undertakings that they should be a little more lavish in public lighting by gas, and let it be an advertisement. Even if the public lighting had to be carried out at no profit at all, the moral effect of the advertisement which they would thereby obtain would be beneficial to every gas undertaking. He would like to ask the author a question with regard to the maintenance of the mantles. He had adopted a particular kind of burner designed by the department themselves with a peculiar attachment. Could he give any figures as to breakage of mantles per lamp, per month or year, as compared with the breakages in the case of burners provided with the improvements introduced by the department?

Mr. T. Hornby (Longford) said he quite agreed with Mr. Paterson that it did seem a great pity that a city like Glasgow should adopt such a small burner. The use of a bijou burner did appear to be rather a cheeseparing policy. As to the stated efficiency of the burner, he would like to ask whether this was the tested efficiency, because they received catalogues from different makers giving anything up to (say) 40 candles per cubic foot of gas consumed with low pressure. He would also be glad to know whether the author had tested the consumption with the volumetric governor, because he noticed that the pressure varied from 20-10ths to 45-10ths, and they wanted to be quite satisfied that the governor was capable of keeping the consumption down to the figure quoted. Another thing which struck him as being rather strange for a gas department of the size of that in Glasgow was that they were letting out the making of lamps to contractors. His own experience with a large company the other side of the Channel was that they had to cease doing this. It was his opinion that, when the work was done properly, gas undertakings could make lamps cheaper than a contractor, and certainly better.

Mr. Littlejohn, after thanking the members for the kind hearing they had given him, remarked that, of course, a Scotchman always got blamed for being hard-fisted and economical. For the burners they were permitted to use, their lighting was efficient; but he quite agreed that the bijou size was too small for public lighting. In Glasgow, however, they had private streets and public streets; and in the case of the former, the owners of property in the streets were forced to pay for the lighting. He believed the amount they paid was 15s. per lamp; and it was impossible to do much at this price. They were not allowed to put it on the rates, and were therefore bound to stick to the 15s. The Lighting Department were simply consumers of gas; and they had to pay 1s. 6d. per 1000 cubic feet for it. The Gas Department was a separate concern; and if they could give a supply cheaper, and get an advertisement from it, that was their look out. This was why they had to use the governors. In those places where the breakage of mantles proved very excessive, they found a mantle lasted from three to four days without the anti-vibrator. Now they could get them to last from twenty to twenty-eight days. In ordinary streets without vibration, the mantles lasted about sixty-five days. The results were greatly in favour of anti-vibrators in places where the breakage was at all excessive. In private streets the lamps were lighted some 3600 hours per annum. That was to say, they were lighted every night in the year. A question had been asked as to whether the efficiency of the burners was tested or otherwise. The efficiencies stated by him were not tested ones. Though he had not done much, he had found in testing that the stated efficiencies were far too high. About 15 candles per cubic foot for these very small units was the most one could get. For a consumption of 2·8 cubic feet per hour, he had obtained 18 or 19 candles per foot. With high-pressure gas-lamps he had got 40 candles per foot, but not higher. As regarded the volumetric governors, they passed the required quantity of gas at 20-10ths; but as the pressure got higher, the amount of gas going through increased slightly, until a point was reached at which any further increase of pressure resulted in a decreased quantity of gas passing through, owing to the fact that the diaphragm got jammed at the top. This happened more especially when the governor became dirty. With reference to the letting-out of the making of lanterns in Glasgow, he thought their own tinsmiths would really make a better job of it, but that they would be much dearer. In Glasgow they did not accept German work; and the lanterns had to be made by the contractors as the department wished, whether it paid them or not.

INSPECTION OF GAS LIQUOR AND OTHER WORKS UNDER THE ALKALI ACT.

District Inspectors' Reports.

In the "JOURNAL" for Aug. 18 the last annual report of the Chief Inspector under the Alkali Works Regulation Act, 1906 (Mr. W. S. Curphey), was fully dealt with. We now give some extracts from the reports of the District Inspectors.

As usual, the first report is by Mr. E. G. Ballard, the District Inspector for Ireland, where there are 63 works, in which 86 processes are carried on. He paid 144 visits and made 103 tests. The past year was not free from infractions as regards the escape of noxious gases into the atmosphere, of which there were six cases; but they all occurred at sulphuric acid works. Three of them were satisfactorily explained and soon rectified; but the remaining three extended over several days, and occurred at new works, where the owners had no experience in acid making, and the manager, who is also the chemist, was away ill at the time. As regards other works in the district, Mr. Ballard had but little to complain of as to the way in which they were conducted. Taking all the places where sulphate of ammonia is made in Ireland, the number of works absorbing sulphuretted hydrogen in oxide of iron is 36, the number burning it 3, those working on the continuous system of distillation 34, and those working on the intermittent system 5. The proportion of total liquor distilled by the two systems was 97·9 and 2·1 per cent. Products equal to 2753 tons of sulphate of ammonia were made during the year.

In addition to Ireland, Mr. Ballard has under his supervision Cheshire, North Wales, and part of Lancashire, in which are 91 works and 147 separate processes. Seven of the latter are carried on in gas-liquor works; and they were all carefully conducted. At all the tar-works, efficient means exist for dealing with the noxious vapours evolved at certain stages of the process of distillation.

Reporting upon the North of England district, Mr. E. Morley Fletcher says there was an addition of four sulphate of ammonia and two tar works during the past year. There were 639 visits paid to registered works in the district, and 623 quantitative tests made of the gases resulting from the various processes. The plant generally was kept in a condition of efficiency, and no prosecution for offences under the Act was necessary. The number of works registered at the close of the year for the manufacture of sulphate of ammonia was 85. Of the four new works, three were coke-oven works with recovery of bye-products; and the fourth was a gas-works where direct recovery of ammonia from crude coal gas by washing with weak sulphuric acid is adopted. This is the first plant of the kind in the district; and Mr. Fletcher says the attention of managers of small gas-works might well be drawn to this method of sulphate of ammonia manufacture. A continuous ammonia still has replaced intermittent plant at one works; leaving only four works where the intermittent process is in use. There was a 17 per cent. increase in the quantity of sulphate of ammonia made last year as compared with the previous year; but this was in part due to the coal strike in 1912, which caused a diminution in the output. As already mentioned, two new tar-works were registered; and dehydration of tar for road purposes is now carried on at another works already on the register. The arragements for dealing with the noxious gases were in all cases satisfactory.

In the district comprising Widnes, Runcorn, and Liverpool, which is under the supervision of Mr. Herbert Porter, there are 42 alkali and other scheduled and registered works, and the number of separate processes under inspection last year was 100. The different methods of treating the sulphuretted hydrogen evolved from gas-works liquor are shown as follows, in terms of sulphate of ammonia percentage of the total make: Absorbed by lime or oxide of iron, 16·6; by combustion, 7·7; by other methods, including absorption in ammoniacal liquor, 75·7. Mr. Porter says all this class of plant, as well as that for the distillation of tar, was properly worked and maintained during the year. There was a tendency to increase the size of the tar-stills. This was done somewhat extensively at two works; and it was expected to be continued in the present year.

Reporting upon North and East Lancashire and part of Yorkshire, Mr. H. J. Bailey says there were 57 works in which processes connected with the production of gas liquor and sulphate and muriate of ammonia were carried on; 50 being registered for the manufacture of the latter articles, and 11 for making concentrated gas liquor. The proportion of ammonia distilled by the continuous process was 97·2 per cent. of the total. Ammoniacal liquor produced at coke-oven plants was distilled at five works. At two of them liquor ammonia only is produced, at two the Claus process is still in use, and at the remaining one (where the foul gases are destroyed by combustion) the average total acidity of the chimney gases was 0·83 grain per cubic foot, expressed in terms of sulphur trioxide. One new large coke-oven plant came into operation during the year in this district, where the plant erected for the distillation of ammoniacal liquor is of an efficient and up-to-date type. Two accidents unfortunately occurred there—in one case, which was not serious, in clearing a stopped ammonia-pipe; and in the other case, which proved fatal, an electrician fell from near the roof when fitting electric wires. There was no evidence in the latter case that the process carried on in the building was in any way contributory to the accident.

At one works early in the year a serious escape of sulphuretted hydrogen was noted, emanating from the ground in which the foul-gas main was laid. The plant was stopped, and on laying the main bare it was found to have corroded through in several places. The pipe was renewed forthwith, and was laid in a brick culvert covered by boards, so that proper inspection of its condition could be made from time to time. The plant generally was kept in good condition during the year. The flat heap purifiers still give satisfaction where in use, and are gradually replacing the old box type of purifier. There were 26 works registered for the distillation of tar—two new works having been started, and a like number having discontinued operations. Mr. Bailey says that these works were conducted with care during the year, and no accidents or complaints had to be recorded in connection with them. Generally managers realize the care required when still-cleaning is necessary; and where two or more stills are operated, physical disconnection from the foul-gas main is resorted to.

Mr. Robert D. Littlefield, in his report on the East Midland District, states that the number of registered works at the end of the year was 150, of which eight were alkali works. The total number of registered processes under inspection amounted to 234. Of the five new works, one was for the production of chemical manure and sulphate of ammonia, and the others were muriatic acid works. During the year, 580 visits were paid and 500 chemical tests were carried out at works in the district; and, in addition, there were 93 visits and 264 tests in the South Midland and Norfolk District, under Mr. E. Jackson. There are 53 sulphate and muriate of ammonia works and eight gas-liquor works under inspection; and the complete direct ammonia-absorption plant for dealing with coke-oven gas, referred to in the report for 1912, was put into operation last year. Works generally were busy; and in all cases plant was maintained in good order. In works making sulphate of ammonia, the proportion produced by the continuous process amounted to 99·5 per cent. of the total. Calculating on the basis of the sulphate of ammonia equivalent of the total gas liquor dealt with in the district during the year, there is an increase amounting to 17·8 per cent. over that similarly produced during 1912. Separating the amount of sulphate made under the headings "ordinary gas-works" and "coke-oven works," there is a decrease of 3·4 per cent. in the former class and an increase of 40·9 per cent. in the latter. The proportions of ammoniacal liquor dealt with, and the corresponding figures for 1912, still using the sulphate of ammonia equivalent as the basis of the calculation, were as follows:—

	1913.	1912.
Gas-works	39·1 p. ct.	47·3 p. ct.
Carbonizing-works	1·5 ,,	2·2 ,,
Coke-ovens	56 3 ,,	46·9 ,,
Producer-gas works	1·5 ,,	3·6 ,,

Mr. Littlefield points out that coke-oven plants are now responsible for considerably more than half the total sulphate of ammonia made in this district; and he says it seems probable that the output from this class of plant will increase in the near future. Several new works are in course of erection; and in a number of cases additions have been made to the existing ovens. There are 23 works registered for the distillation of tar; and all of them were carefully conducted.

Reporting upon the South Midland and Norfolk district, Mr. Edward Jackson says there were 691 official visits paid, including the 93 by Mr. Littlefield already referred to. Six new works were added to the register—three being for the distillation of tar and two for the manufacture of sulphate of ammonia. The number of works registered where sulphate, chloride, or carbonate of ammonia is manufactured or gas liquor is concentrated is 114. Sulphate of ammonia is produced at 107 works, chloride of ammonia at 6, and gas liquor is concentrated at 12 others. Thus 125 plants are under inspection for the three processes referred to. Only two new works for sulphate of ammonia manufacture were registered during the year; and at both of them plants for the direct process were put into operation. One is in connection with coke-ovens; and the hot gases are passed through sulphuric acid of sufficient gravity to deposit the sulphate of ammonia crystals in the saturator. In the other case, the plant is at an ordinary gas-works, and the coal gas, after extraction of the tar, is washed with a weak (1 to 2 per cent.) sulphuric acid to arrest the ammonia; the resulting solution of the sulphate being then evaporated to the salting-point. The crystals produced by both of these processes are stated by Mr. Jackson to be of very good quality. He adds that it is interesting to be able to report that the direct recovery of ammonia at ordinary gas-works has made further progress in the district. Two more plants were erected last year, in addition to the one referred to in the report for 1912 as working satisfactorily; and a fourth is almost completed.

The erection of bye-product coke-ovens still further increased during the year; but only one new works came into the list. At these works the direct and semi-direct processes of sulphate of ammonia production are increasing in favour. There are 23 bye-product coke-oven plants in the district where sulphate of ammonia is manufactured. At five works chloride of ammonia is also produced, and

at one works gas liquor is concentrated in addition to the manufacture of sulphate and chloride of ammonia. The sulphate produced from coke-ovens in 1912 reached 42·9 per cent. of the total make in the district. Six producer-gas plants of the Mond type are at work in the district; and two other new plants are nearing completion. Of the total sulphate of ammonia produced, 11·3 per cent. comes from these plants. There are 80 sulphate of ammonia and gas liquor concentration plants in operation at gas-works, and little change in them can be reported in the methods of dealing with the sulphuretted hydrogen from the processes. From this source comes 43 per cent. of the total ammonia compounds.

There was a considerable increase in the production of ammonia compounds last year compared with the previous year, amounting to 17·4 per cent. on the 1912 figures. Coke-ovens are responsible for more than 70 per cent. of the increase, gas-works contribute 20 per cent., and the remaining 10 per cent. is divided between producer plants, iron-works, and coal-carbonizing plants. The proportions of ammoniacal liquor produced in the district from the different sources, on a sulphate of ammonia basis, compared with the two previous years, are given below:

	1913.	1912.	1911.
Gas-works	43·0 p. ct.	46·0 p. ct.	48·8 p. ct.
Coke-ovens	42·9 ,,	38 0 ,,	37·6 ,,
Producer-gas works	11·3 ,,	12·3 ,,	10·2 ,,
Iron-works	1·8 ,,	1·9 ,,	2·1 ,,
Carbonizing-works	1·0 ,,	1·0 ,,	1·3 ,,

It will be observed that coke-ovens now account for nearly half the total production.

Mr. Jackson says there is an important tendency towards an increase in the tar-works in the district, due to two reasons—the demand for "prepared" (dehydrated) tar for road dressing, and the increased scale of operations at the coke-ovens, which has resulted in a number of these works distilling the tar produced in them. Six new plants were put into operation last year, and one small plant was closed. The number of works now registered is 48; being a net increase of five over the previous year. Six years ago the number of tar-distilling plants in the district was 29. Four of the new plants erected are worked for the production of "prepared" tar only; and in each case the uncondensed gases escaping from the worm ends of the condensers are arrested in lime purifiers. The remaining two new works are in connection with coke-ovens. The ordinary tar-distilling operation is carried on in both of these; and the waste gases in each case are dealt with by the combustion method.

Dealing with the district comprising the South and South-West of England, Dr. Alfred C. Fryer gives the number of registered works at the close of last year as 172, of which only one was an alkali-works. Dr. Bailey, who has charge of the South Wales and Monmouthshire district, again rendered substantial help in visiting works and testing the escaping gases. The number of visits paid was 826, and of tests made 657; the figures including 150 visits and 225 tests by Dr. Bailey. Two new sulphate of ammonia works were added to the register, and one was removed. The number of works registered at the close of the year where either ammonium sulphate or chloride is manufactured was 105. Two new works were registered for sulphate manufacture. These plants have continuous stills, hand-fishing saturators, suitable condensers, and oxide of iron purifiers. Two small works discontinued to make sulphate of ammonia, and the plant at one of them was dismantled. Four works built new sulphate-houses and erected new stills in place of more antiquated arrangements. New saturators replaced old ones at seven of the plants; and four works put in new oxide of iron purifiers.

Dr. Fryer calls the attention of the managers of small gas undertakings who are not chemists to the fact that every ton of coal carbonized should produce from 25 to 30 lbs. of sulphate of ammonia; and he points out that, if due care is exercised throughout the whole operation, this production should be realized. His remarks on this subject—in the course of which he referred to the article by Mr. Norton H. Humphrys, on "Waste of Ammonia," in the "JOURNAL" for Sept. 16, 1913—were given in full last week (p. 391).

The distillation of tar is carried on at 16 works in the district. In three the combustion method is in use for rendering the worm-end gases inoffensive before being discharged into the atmosphere. In the other works lime and oxide of iron purifiers are employed to arrest the noxious gases. The demand for "prepared"—*i.e.*, tar from which the water and naphtha have been removed by partial distillation—is increasing; and suitable apparatus is being installed at other works.

The number of works registered in South Wales and Monmouthshire (Dr. T. L. Bailey's district) last year was 124. The new works included three sulphate of ammonia works in gas-works, two in coke-ovens, and one tar-works. There is a steady increase in the number of works, which in 1908 was 110; furthermore, there are several new works approaching completion, which will be registered during the coming year, and others are projected. The number of visits paid to registrable works was 646, of which 55 visits were paid by Dr. Fryer. The work of inspection entailed the making of 659 quantitative estimations of the various constituents of chimney and other gases. On the whole, the works were conducted in such a way as to call for little adverse comment. The number of sulphate and muriate of ammonia works has increased to 24; the new registrations including two coke-oven bye-product plants and three sulphate of ammonia plants at gas-works. Two new coke-oven bye-product plants also are nearing completion. Dr. Bailey says the amount of ammonium salts produced in the district during 1913 constitutes a record for both gas-works and coke-ovens. The quantity made was 26 per cent. more than the previous highest total, which was in 1911, and 31 per cent. more than in 1912. The production of the latter year was, however, reduced by colliers' strikes.

Temperature observations were made at the various gas-works, with a view to ascertaining the working conditions of the oxide of iron purifiers. Maximum temperatures during sulphiding ranged between 20° C. in heaps and 69° C. in the closed purifiers of sulphate of ammonia plants; the mean of all maxima being 45° C. Dr. Bailey points out, however, that the abnormally low temperatures were obtained in certain heaps in which, owing to rain, the oxide was unduly wet; and in these cases it was not reacting as satisfactorily as it should have done. Ignoring these cases, the average of maximum temperatures was 50° C. This, he says, impels one to urge the advisability of putting a light form of roof over oxide purifiers, so that the material does not become unduly moist in wet weather. A certain amount of moisture is a necessity; but the condition of the oxide must by no means attain to wetness. He adds that this is a point to which one has frequently had to call individual attention, when purifiers have been working badly, and have consequently needed very frequent renewal.

Dr. Bailey says the direct methods of making sulphate of ammonia at gas-works have not yet made their appearance in South Wales, though there are small works where one would imagine that such an installation would be of great advantage and a source of profit, especially in the western portions of the district, where considerable quantities of ammonium compounds in the form of gas liquor are run to waste. Last year, however, two coke-oven bye-product plants, in which direct methods of sulphate manufacture are employed, commenced work; and up to the present all seems to be going on satisfactorily—salt of very excellent appearance being produced.

One new tar-distillation plant and two tar-dehydration plants were added last year. The total number of tar-works is now nine. All have been satisfactorily conducted. The amount of tar dehydrated in the district for road-making purposes is very considerable; the plants being kept well occupied. The erection of at least one new tar-works is anticipated.

Mr. F. Napier Sutton reports that the number of works registered in the Eastern and South-Eastern district at the close of last year was 193 (an increase of one), and that the scheduled and registered processes under inspection were 280, or two more than in 1912. There were 712 visits to registered works, and 18 to others—a total of 730. The number of quantitative tests made of gases from chimneys, flues, and processes was 692. The concentration or distillation of gas liquor for the manufacture of various ammoniacal compounds is carried on at 96 works in the district. The products consist chiefly of sulphate of ammonia, but include carbonate, chloride, and nitrate of ammonia, liquid (concentrated and refined), and anhydrous ammonia. An increase of some 4600 tons (in terms of sulphate) is shown in the total products on the figure for the previous year. The gas-works belonging to statutory companies and local authorities made 91·2 per cent. of the products; and the balance was made in the works of private firms. At three works the crude gas liquor was concentrated by distillation to about 80-oz. strength, to facilitate carriage to central works, where it was again distilled for various products. The intermittent process survives at five works; and 99·2 per cent. of the gas liquor was treated by continuous distillation methods.

The whole of the saturator gases evolved from the extensive gas-liquor distillation plants of the three chief gas companies supplying the metropolitan area is used direct for the manufacture of sulphuric acid. The proportion thus disposed of is 63·3 per cent. of the whole; and this large quantity of sulphur material is again utilized for subsequent combination with ammonia.

The Claus sulphur-recovery process remains in use at seven works, and deals with 14·4 per cent. of the total saturator gases. The sulphur recovered is either used for acid manufacture, or more generally for the recovery of cyanogen compounds from the crude coal gas by extraction as sulphocyanide of ammonia. Mr. Sutton says the sulphur-recovery process is less popular than formerly, partly owing to the comparatively short life of the brick depositing chambers, and also to the fact that the treatment of large quantities of sulphuretted hydrogen by oxide purification is better understood than formerly. The use of a sheet-lead depositing chamber in place of brickwork has not, unfortunately, extended, though its merits in resisting the destructive action of the acid gas has been well proved.

Treatment of the saturator gases by absorption in hydrated oxide of iron is most generally adopted, and is now practised at 65 of the 90 works of this class; and the proportion of gases so treated amounts to 13·7 per cent. Mr. Sutton remarks that, as may be assumed from the large proportion of works using this method, it is particularly suitable for small and medium-sized works; but of late the method has grown in favour at works where the daily and total make of sulphate is large. The adaptability of the oxide-heap system for large works is now much better understood; but a considerable extent of open ground space is essential if a large quantity of gas is to be treated economically. The system again is useful for cleaning and working-up to high sulphur content oxide which has become inert in the carburetted water-gas purifiers through impregation with oil. The heat of chemical action taking place in an exposed heap of such contaminated oxide will in time entirely remove the oil by volatilization.

The "combustion-neutralization" method of treatment of gases continues in use at ten works, and accounts for 7·7 per cent. of

the total. At two of the works using this method the results were less satisfactory than formerly owing to trouble in maintaining a steady and plentiful water supply to the neutralizing towers. It is understood that at one of these works the method will shortly be discarded in favour of oxide purification on a large scale. The efficiency of the plants at other works has improved, and in most cases reaches a very high figure.

The following table shows the efficiency yielded by neutralizing plants in the past two years :—

Total Acidity of Gases as SO_3. Grains per Cubic Foot.			Percentage of Acid Removed and Neutralized.	
Leaving Furnace.	Leaving Washer.	Leaving Limestone Scrubber.	1913.	1912.
65·4	..	1·11	98·3	96·7
11·2	8 4	0·60	94·6	93 4
16·6	10 2	0 13	99·2	98·1
66·5	16·9	0·39	99·4	92·5
60·0	14·8	0·10	99·9	99·5
19·2	4·6	0·15	99·2	..
47·5	30·7	2 61	94·5	96 8
45·0	..	3·62	92·0	96·3
Average 41·4	14·3	1·09	97·4	96·1

Two works at which the "combustion-neutralization" method is used in connection with the Radcliffe process for the treatment of spent liquors* are not included in the above table. At three works the saturator gases are passed to the crude coal-gas main, and thence to the purifiers. Combustion of foul saturator gases in retort or boiler flues survives at only two works. One is a very small gas-works, and the other treats ammoniacal liquor recovered in the manufacture of bone charcoal.

Complaints were received during the winter of 1912 of alleged nuisance arising from a large sulphate-works on the outskirts of London. Investigation showed that certain of the complaints were groundless so far as the works were concerned; but there was reason to believe that some foundation for complaint existed, as the magnitude of manufacturing operations had outgrown the existing provisions for dealing with the noxious gases evolved. As soon as this view was brought to the notice of the management, steps were at once taken to meet the situation; and very ample provision to safeguard the plant has now been made. At another works very old and worn-out plant of quite obsolete design had for a long time given anxiety to the Inspector. The still was of intermittent boiler type and no lime or caustic alkali had ever been used for the recovery of fixed ammonia in the liquor. The disadvantage of the system and the resulting loss of revenue had been repeatedly pointed out to the management, but without result. Latterly the plant became so utterly worn-out, and the supervision so negligent, it was necessary to threaten the company concerned with proceedings unless the plant was abandoned. The directorate agreed to replacement; and an entirely new and modern plant is to be erected at an early date.

Mr. Sutton says it is satisfactory to note that the observations made in recent reports as to preventable loss of ammonia during the handling and storage of gas liquor has received attention in many quarters. At one works where the storage is entirely above ground, and therefore much exposed to the heat of the sun, the vent-pipes are now sealed in acid to prevent any loss. No figure of the amount of ammonia recovered is available; but it is certain that loss is prevented and gain results. Moreover, the fitting of simple but effective systems for the continuous liming of the stills has extended, with beneficial results on yields. Mr. Sutton thinks the manufacturers of distillation plants will be well advised to give some attention to this point when designing and supplying new plant.

With regard to works for the distillation of tar, Mr. Sutton reports that a small one was closed, and 22 works were engaged last year in the partial or complete distillation of coal and water gas tars. The enormous and increasing demand for partially distilled or dehydrated tar for road purposes absorbed most of the available tar during the spring and summer months, and but little pitch was then produced. In general, the appliances provided for dealing with the permanent noxious gases evolved were efficient and properly used; but Mr. Sutton says alteration and improvement are desirable in two instances, and are to be carried out as soon as practicable.

Two somewhat alarming fires occurred in connection with distillation plants, fortunately without leading to very serious results. In one case pitch was being run from the still to the cooler, from which it is drawn off into barrels, when spontaneous combustion occurred. The pitch had remained the usual time in the still (the last stage being finished by steam injection), and, as far as is known, was no hotter than usual. A possible theory is that a piece of greasy waste may have been carelessly dropped into the cooler. The other fire occurred on a very calm night in connection with one of the small continuous dehydrating coil plants. While clinkering the fire of the heating furnace, the light oil distillates in an open store-tank some 20 feet distant caught fire. Mr. Sutton says it is well to remember that the spirit and light oil recovered is very volatile, and the vapours highly inflammable. No complaint occurred in the past year of nuisance arising from this class of works.

* This process was described by Mr. Radcliffe in the "JOURNAL" for Oct. 2, 1906 (p. 22); and references to it will also be found in Vol. CXVII., pp. 267, 276, and Vol. CXIX., p. 452.—ED. J.G.L.

Report to the Secretary for Scotland.

As usual, the Chief Inspector's report to the Local Government Board, already noticed [*ante*, p. 390], is accompanied by one presented to the Secretary for Scotland, which embodies a report by Mr. J. W. Young, B.Sc., the District Inspector for this part of Great Britain. We will deal with the latter first.

Of the 295 processes under inspection by Mr. Young, 108 relate to the manufacture of sulphate and muriate of ammonia, 8 to the treatment of gas liquor, and 42 to the distillation of tar. The quantity of sulphate of ammonia produced was—

	Tons.
Gas-works	21,626
Iron-works	18,554
Shale-works	63,061
Producer-gas, coke, and carbonizing works	22,205
Total	125,446

The total for 1912 was 120,347 tons. The most marked change was in the yield of sulphate of ammonia from the iron-works (18,554 tons compared with 15,861 tons before) and of pitch (174,884 tons, against 151,345 tons). The number of visits of inspection was 670, and of chemical tests 586.

The following is Mr. Young's report on the sulphate and muriate of ammonia and gas liquor works in his district:

There were 119 works registered for these processes last year, as two new works were started; 236 visits were paid to them—urgent calls elsewhere preventing so much attention as usual. The total quantity of gas-works liquor distilled was equivalent to 21,626 tons of sulphate. This was dealt with on the continuous system at 67 works.

The sulphuretted hydrogen evolved in the process of manufacture was destroyed at the various works as follows :—

	Number of Works.	Approximate Proportion in Terms of Sulphate.
In oxide of iron purifiers	65	69 p.c.
By combustion	4	17 ,,
By the Claus process	1	12 ,,
Precipitated by metallic salts	2	2 ,,

In the case of the second method, it was used in combination with the first. The other works registered for these processes—viz, iron-works, shale-works, coke-ovens, and producer-gas works—have proceeded with their methods unchanged.

The average acidity of the chimneys draughting the residual gases of combustion processes for gas-liquor works has been 0·61 grain of sulphuric anhydride; from the Claus process, 0·20 grain; and from coke-oven chimneys, 0·56 grain. The first amount is somewhat higher than last year; but the other two are markedly lower. Sulphuretted hydrogen has been absent in all these tests.

It has seldom been necessary to blame the condition of oxide of iron purifiers, which is by far the most general method of destroying foul gases. At one works, where the volume to be absorbed is very great, and where the purifiers were so large as to be unwieldy and their periodical renewal a disturbance to other operations, these have been replaced by a number of smaller purifiers, over which it is much easier to exercise good control.

Several cases have occurred, and nearly all in one particular type of saturator, in which premature failure of the cracker-pipe has been traced either to actual fracture or to undue enlargement of the holes pierced through its sides. Such failure causes loss of ammonia as well as disorganized manufacture. A harder material than is now employed seems required for the composition of these pipes. Other works have found trouble from the use of too acid a bath within the saturator.

At some of the three vacuum plants for distilling gas liquor it has been necessary to renew the copper saturators or to repair extensively. With them it is most important that the contents should never be allowed to become alkaline. At other works registered for these processes there is no change to report, except that there is tendency for gas firing to replace solid fuel, on account of the value of the recovered residuals. At the coke-ovens using the direct sulphate of ammonia process I hear of yields more abundant than formerly. There is no present example of this system applied to the manufacture of illuminating gas.

The influence of the vertical gas-retort, of which now there are frequent installations, it is too early as yet to recognize by any decisive change in the character of bye-products.

A case of partial poisoning by inhalation was reported from one of the shale-works. The man affected had been cleaning a sulphate of ammonia saturator laid idle for repair. Precautions suitable in washing and ventilation had been taken beforehand. The causes of poisoning were obscure, and though more readily to be explained by the evolution of arseniuretted hydrogen, to which his symptoms were attributed by the physician, it is uncertain that all the conditions necessary for such evolution were present. A valuable warning has, however, resulted against the use of new and galvanized iron pails to contain refuse which has been in contact with arseniferous acid. A stout wooden bucket is much safer, and also more durable.

Returning to the report of the Chief Inspector, he says the production of sulphate of ammonia in Scotland decidedly increased during the past year. In 1912, however, production was greatly disturbed by the prolonged strike of coal miners, which adversely affected coal carbonizing works, but more especially iron-smelting

works. The gross production was in this way affected to the extent of a reduction of 992 tons in 1912 as compared with 1911. For 1913 the figures are—

	Increase over 1912.
Gas-works	287 tons
Iron-works	2693 ,,
Shale-works	854 ,,
Producer-gas, &c., works	1265 ,,
Total	5099 tons

Despite the large increase shown above in iron-works, the production in 1913 fell short of that of 1911 by 307 tons. The shale-works had a busy year; and the increase of 854 tons, following an increase for 1912 of 1442 tons, indicates an active busy time for the Scottish oil trade.

The production of coke from ovens provided with recovery plant continued to increase last year. The direct system of producing sulphate of ammonia was carried on with satisfaction in coke-oven works; but, so far, this type of plant has not been put into operation in any Scottish gas-works.

Mr. Curphey says that in works distilling gas liquor for the manufacture of sulphate of ammonia, the oxide of iron purifier is the means most generally in use for dealing with the noxious gases evolved. The behaviour of oxide of iron with sulphuretted hydrogen is therefore of interest to many. The results of the further study of this subject during the year are put forward in his report to the Local Government Board. [See *ante*, p. 390].

The Chief Inspector takes the opportunity of thanking Mr. Alexander Yuill, gas engineer, of Dundee, and Mr. A. Ballantyne, of Hamilton, for their further aid and co-operation in obtaining information on the points dealt with in this year's report on the subject of the behaviour of oxide of iron purifiers.

In continuance of the table presented in recent annual reports of the progress of shale distillation and ammonia recovery, Mr. Curphey gives figures compiled from the statistical returns to the Home Office on mines and quarries for the last ten years to December, 1913, and from returns of sulphate of ammonia manufactured. The figures for last year are: Total shale mined and quarried in Scotland, 3,280,143 tons; total sulphate of ammonia recovered from the shale in paraffin oil works, 63,061 tons; yield per ton of shale, 43·1 lbs. Mr. Curphey points out that the ratio is affected by various factors, one of which is that some of the shale mined is used elsewhere than in shale-oil works. The ratio is therefore not strictly accurate as to the recovery of ammonia per ton of shale distilled in these works. But it is approximately so; and the figures for the different years are comparable. The limited fluctuations in the figures of the yield per ton of shale show that little improvement is practicable over the results of recent years.

Principal Systems of Coke-Ovens.

The "Engineering Review" for this month says that the July issue of the "Revue de Métallurgie" contains an extensive study of the principal systems of regenerative coke-ovens, by M. Charles Berthelot—chiefly concerning their stability and their economic applications. The points considered include the obtaining of the maximum coke yield, the maximum yield of bye-products, the quality of the gas, and the solidity of the design of the oven. The ovens examined consist of:

(1) Recuperative ovens, Solvay type.
(2) Longitudinal regenerators in parallel, Otto, Collin, Still, Piette, Simplex, and Carves.
(3) Longitudinal regenerators in series, Coppee type.
(4) Transverse regenerators in parallel, Koppers.
(5) Transverse regenerators in series, Lecocq.

The various furnaces are examined at considerable length; and note is made of the great increase in variable surplus gas by the introduction of regenerative ovens. The theoretical conception of the Lecocq oven is admired, particularly in regard to the conservation of heat, although attention is drawn to the inconvenient disposition of the regenerators. The paper is, says our contemporary, worthy of careful study by those interested in this subject.

Wales and Monmouthshire District Institution of Gas Engineers and Managers.—The Hon Secretary (Mr. Octavius Thomas, of Pentre) has issued an intimation to the effect that the Council have decided, owing to the present state of national affairs, to abandon the general meeting of members which is usually held in September.

Absorption of Oxygen by Coal.—This subject forms a prominent feature of the programme for the next annnal meeting of the Institution of Mining Engineers, which will be held on the 9th prox. at the Central School of Science and Technology, Stoke-upon-Trent, under the presidency of Sir William E. Garforth. A paper already submitted by Mr. T. F. Winmill, B.A., B.Sc., the Chief Chemist at the Doncaster Coalowners' Research Laboratory, will be open for discussion; and in other papers he will deal with the quantity of oxygen absorbed, the thermal value of the absorption, the influence of temperature, and the ratio of spontaneous heating of coal. "The Influence of Temperature on the Rates of Absorption of Different Parts of the Barnsley Bed" is the subject of a paper by Mr. J. Ivon Graham, B.A., B.Sc., a chemist at the above-named Research Laboratory. Owing to the present condition of national affairs, it has been considered desirable to cancel all the arrangements in connection with the dinner, visits to works, excursions, &c.

GAS MEASUREMENT BY THE THOMAS METER.

It will doubtless be remembered that, in the course of his Presidential Address at the last meeting of the Institution of Gas Engineers, Mr. Edward Allen referred to the Thomas electric meter, one of which—the only one in this country—he has on trial at the Linacre works, Liverpool. He explained that it is on an entirely new principle, which bids fair to revolutionize the present method of measuring gas. A series of tests made at the works named, comparing the measurements of gas recorded by the Thomas meter with the readings of a large station meter of the ordinary type (the same gas passing through both), gave very encouraging results. The Thomas meter was capable of passing 750,000 cubic feet of gas per hour; while the capacity of the ordinary station meter alongside of it, occupying seven times the space, is only 175,000 cubic feet per hour. The meter was described in a paper read by Professor Thomas at the annual meeting of the American Gas Institute in 1912, and given in the "JOURNAL" for Jan. 21, 1913 (p. 186); and interest has been revived in it by Mr. J. C. Wilson, who, in a paper on "The Large Quantity Measurement of Artificial Gases in Distribution Systems," read at the last annual meeting of the Wisconsin (U.S.A.) Gas Association, dealt with the meter at some length, and gave particulars of five tests of it carried out at one of the stations of the Detroit City Gas Company. The following are extracts from the paper.

While experimenting with the heating of flowing gases through known temperature ranges in the engineering laboratories of the University of Wisconsin, Professor C. C. Thomas found out that, for a given industrial gas, it always takes almost exactly the same quantity of heat to raise the temperature of a cubic foot through a fixed range. If we define the specific heat of a cubic foot of gas as the number of British thermal units required to raise the temperature of one standard cubic foot 1° Fahr., then it may be said that Professor Thomas's experiments established that this specific heat value is almost a constant, with the variations in composition ordinarily found in practice.

At first thought this does not seem quite reasonable, because of the widely varying composition of manufactured gases from day to day, with differing fuel and plant operation, &c. Further investigation showed that this peculiar condition was due to the fact that the specific heat values for the various constituents of these gases per unit volume under given temperature and pressure conditions are very nearly the same. So long as this is true, and so long as the same general characteristics obtain in the gas, the specific heat per cubic foot of the mixture of these gases must remain nearly the same. Although the specific heat values of the illuminants are somewhat higher than those of the other constituents, these gases are present in comparatively small quantities, and a variation in their amount has but little effect upon the total specific heat value. Moreover, the regulation of the relative amounts of these illuminants and the remaining constituents of the gas for the maintenance of a constant heating value also tends to keep the specific heat constant. In his paper on "Recent Developments in Gas-Measuring Apparatus," presented at the 1912 meeting of the American Gas Institute, Professor Thomas illustrated with a variety of gases the constancy of the value of specific heat with varying composition, and showed that the specific heat of water gas varies by only a very small percentage from that of coal gas, in spite of their widely different analyses. In accordance with the law of physics, the specific heat value of the standard cubic foot remains almost constant when the cubic foot of gas is compressed to a higher pressure and smaller volume. This means that if a standard unit of gas is compressed to one-third its original volume, it still takes the same number of British thermal units to raise its temperature 1° Fahr. Similarly the specific heat value for the standard cubic foot remains practically constant when the cubic foot is raised to a higher temperature, and thus caused to increase its volume; or when its temperature is decreased and its volume correspondingly decreased. In other words, it takes the same number of units to raise the temperature of a standard unit quantity of gas from 100° to 101° as it does to raise its temperature from 60° to 61°.

One exception to this statement must be made in the case of high temperature manufactured gases at low pressure. As such gases increase in temperature above 60° Fahr., they will hold an additional quantity of water vapour over the quantity they will hold at the standard temperature, and they will absorb this additional amount if brought into immediate contact with water. This, of course, increases the value of the specific heat by a small amount. The method of compensating for this small variation in the specific heat value of the standard unit is described in a later paragraph. From a common-sense standpoint, it is entirely reasonable to believe that this specific heat value of the standard cubic foot does not change when the gas is compressed to a smaller volume, or expanded by temperature to a larger volume, because there still remains the same amount of "stuff" as the original cubic foot contained, and it should therefore require the same amount of heat to raise its temperature 1°.

The discovery that this physical property of industrial gases remains constant within commercial limits through all the variations in composition, temperature, and pressure led to the development of a method of measurement based on the specific heat value of the standard cubic foot of gas. It seemed evident that

if heat could be applied to a flowing gas to produce a known constant temperature rise in that gas, and if the quantity of this heat could be measured, its measure would constitute a measure of the quantity of gas flowing. Professor Thomas had already learned that a good way to raise the temperature of a flowing gas through a small range was by means of electrical energy, because it can so easily be converted into heat, so easily controlled, and so easily measured.

The following equation forms the basis of his method:

$$\frac{\text{Cubic feet} \times \text{specific heat} \times \text{temperature rise}}{3{\cdot}415} = \text{watt-hours, in}$$

which

Cubic feet = the number of standard cubic feet of gas at 30 in. and 60° flowing per hour.

Specific heat = B.Th.U. required to raise 1 standard cubic foot of gas 1° Fahr.

Temperature rise = the temperature rise in degrees Fahr. produced in the gas by the heat supplied.

Watt-hours = number of watt-hours of electrical energy in the form of heat required to bring about the given temperature rise.

3·415 = the B.Th.U. equivalent of 1 watt-hour.

From this equation it is apparent that if the temperature rise in the gas is maintained constant, and if the specific heat of the standard cubic foot remains constant within practical limits, as we have shown it to be, the number of watt-hours required to bring about the constant temperature rise will be a direct measure of the gas flowing—not of the number of actual cubic feet flowing through the meter, but of the number of standard units of gas passing regardless of its temperature and pressure.

This method of measurement and the meter developed from it bear Professor Thomas's name, but, because of the electrical features involved, it is often termed the "Electric" meter. Since the meter has been developed into working form, and the method of measurement subjected to the final test of service, the theoretical conclusions regarding the constancy of the specific heat value, with variations in composition, pressure, and temperature, have been proved beyond a doubt. The way in which the basic equation has been developed into a commercial meter is described in Professor Thomas's paper previously referred to. [An illustrated description of the meter follows.]

Professor Thomas did not describe the compensation method employed to provide against error from the increase in specific heat of the standard unit due to the added amount of water vapour which artificial gases absorb at high temperature; and it may be well to touch briefly upon this detail here. The percentage variation in specific heat of the standard cubic foot due to this additional water vapour content is approximately one-half the corresponding variation in volume for the same change in temperature. It is also a direct function of the temperature of the gas, since such gases are assumed to be just saturated. It is evident from a glance at the basic equation for this meter that this increase in specific heat value will be compensated for if the temperature rise in the gas brought about by the meter is correspondingly decreased. When such high-temperature gases are to be measured, the temperature difference coil in the meter, the resistance value of which determines the amount of the temperature rise, is located in the flowing gas, and is made of such material that its resistance decreases at the desired rate with increase in temperature. Thus the temperature rise in the gas and the variation in the specific heat of the standard unit become similar, but opposite, functions of the same temperature variation, and can be designed to compensate very accurately.

The accuracy of the meter in the measurement of coal gas and water gas, and particularly of its ability to compensate for the water vapour content in low-pressure high-temperature gases, is shown in Tables I. and II., containing summaries of very careful tests carried out at Station A of the Detroit City Gas Company on coal gas against a new wet meter, and on water gas against an enclosed gasholder. These tests were all made against a brick enclosed holder which offered excellent opportunities for accurate tests, since the temperature of the water and of the surrounding atmosphere could be closely regulated. The Thomas meter has been checked against all other reliable methods in the measurement of nearly all industrial gases and also quite extensively in the measurement of air.

The principal features of the Thomas meter, which make it specially adaptable to the measurement of gases in distribution systems, may be briefly outlined as follows:

1.—The ability to give results in standard units of gas at 30 in. and 60° saturated, regardless of the actual temperature or pressure of the gas flowing through it or their variations.

2.—The very wide range in rate of flow through which accurate measurement is possible.

3.—The ability to trace variations in flow on a graphic chart.

4.—The low cost at which widely varying rates of flow can be measured.

5.—The lack of necessity for daily inspection and care, and facilities for periodic inspection and checking of those features which can affect accuracy.

Of these features, the ability to give results directly in standard units, even when the actual pressure and temperature of the gas passing the meter are varying through wide limits, is the most unique and the simplest. The meter does this, not because of any corrective feature involved in its design, but because it depends for its operation upon a property of the gas which does not change appreciably with variations in pressure and temperature. A clear conception of this feature can best be obtained by viewing the whole measurement problem from the standpoint of present-day requirements, and then considering the solution independently of the former volumetric methods and the corrections necessary to reduce results obtained by them to standard units. Its simplicity and directness can probably be best understood by a concrete example.

Table III. shows the results of a 24-hour period of a test of

TABLE I.—*Summary of Five Tests of the Thomas Meter against a Wet Meter on Coal Gas.*

Number of Test	1.	2.	3.	4.	5.
Cubic feet by wet meter, uncorrected	1,111,700	1,737,800	1,071,800	1,258,800	504,600
Average temperature in degrees Fahr.—					
Inlet	88·90	87·20	87·72	86·95	89·20
Outlet	85·00	84·20	84·55	84·01	85·10
Gas in meter	86·90	85·70	86·13	85·48	87·15
Average pressure, in inches—					
Inlet	9·96	10·78	11·27	12·86	12·64
Outlet	8·93	9·87	10·20	11·86	11·58
Gas in meter	9·45	10·32	10·73	12·36	12·11
Average barometer	29·36	29·44	29·48	29·58	29·65
Cubic feet of gas by wet meter, corrected	1,031,101	1,628,145	1,005,777	1,192,462	476,443
Thomas meter, average temperature of inlet, degrees Fahr.	83·70	83·00	83·50	84·00	84·00
Total cubic feet by Thomas meter	1,031,500	1,639,300	1,010,800	1,201,900	479,600
Percentage difference in results from the two meters	0·04	0·70	0·50	0·80	0·60

TABLE II.—*Summary of Seven Tests of the Thomas Meter against Holder on Water Gas.*

Number of Test	1.	2.	3.	4.	5.	6.	7.
Initial readings—							
Contents, cubic feet, uncorrected	25,902	26,680	25,124	27,459	34,854	44,974	43,806
Temperature of water in holder, degrees Fahr.	68	68	66	66	65	64	63
Temperature of air surrounding holder	74	66·5	69·3	67·5	62·5	65·5	63 5
Temperature of gas in holder, estimated	71	67·3	67·6	66·7	63·7	64·75	63·25
Pressure of gas in holder, inches of water	3·6	3·6	3·6	3·6	3·6	4·0	3·6
Barometer	29·65	29·67	29·83	29·86	29·59	28·76	29·68
Contents in cubic feet, corrected	25,081	26,120	24,695	27,093	34,334	44,529	43,364
Final readings—							
Contents in cubic feet, uncorrected	257,107	237,257	243,484	243,484	237,256	242,705	245,431
Temperature of water in holder	68	66	64	68	66	64	62
Temperature of air surrounding holder	71	65	66	68	68	65·5	64
Temperature of gas as pumped out, mean	70·87	65·62	63·36	68·98	70·03	66	65
Pressure of gas	3·60	3·60	3·60	3·60	3·60	4·00	4·00
Barometer	29·66	29·84	29·86	29·75	29·42	29·71	29·67
Contents in cubic feet, corrected	249,111	234,669	242,510	237,981	228,382	239,135	242,019
Mean temperature of gas passing Thomas meter	85·0	85·7	87·3	88·5	98·1	93·3	92·3
,, ,, ,, entering holder	80·5	82·0	81·7	83·7	91·0	86·2	87·0
Total cubic feet by holder test, corrected	224,030	208,550	217,815	210,888	194,048	194,606	198,655
,, ,, ,, Thomas meter	223,200	204,700	218,800	210,700	196,300	195,000	199,200
Percentage error in Thomas meter, based on holder	− 0·4	− 1·8	+ 0·5	− 0·1	+ 1·2	+ 0·2	+ 0·28

long duration with a Thomas meter at Brave (Pa.), in series with a very finely equipped Pitot tube station at Bula measuring high-pressure natural gas. The second column gives the Thomas meter readings taken direct from the totalizing dial; the third column the standard cubic feet of gas which flowed through the meter during each three-hour period (obtained directly by subtracting the dial reading at the beginning of the period from that at the end). It should be noted that the pressure of the gas varied from 113 to 162 lbs. during the 24 hours, and that the gas temperature differed considerably from the standard. The results at the Pitot tube station were obtained by careful observations taken every fifteen minutes, and reduced to standard results by the use of the tables and constants derived from extensive calibrations.

TABLE III.

Time.	Electric Meter Reading.	Cubic Feet. Electric Meter.	Cubic Feet. Pitot Tube.	Pressure. Brave.	Pressure. Bula.	Temperature. Brave.	Temperature. Bula.
12 . . .	2498·0	—	—	—	—	—	—
3 . . .	2603·6	1,056,000	1,056,539	134	140	47	46
6 . . .	2714·3	1,107,000	1,115,176	157	161	47	43
9 . . .	2831·7	1,174,000	1,160,802	156	160	47	44
12 . . .	2965·0	1,333,000	1,311,671	162	167	47	43
3 . . .	3086·7	1,217,000	1,226,774	162	166	47	42
6 . . .	3215·0	1,283,000	1,310,577	114	124	47	40
9 . . .	3375·0	1,600,000	1,614,811	113	125	47	40
12 . . .	3523·2	1,482,000	1,480,000	135	143	47	46
Totals . . .		10,252,000	10,276,350				

The range from maximum to minimum rate of accurate measurement with the Thomas meter is normally about 30 to 1; but it can be made considerably wider. This range corresponds quite closely to the range in the rate of demand in a small city in which gas is used for the usual lighting and heating purposes. The meter is able to measure through this very wide range because of the wide range of accuracy in the watt-hour meter, and because the medium measured—electrical energy supplied to the heater—is proportional to the rate of flow, and not to its square, as is the case with many meters.

The ability to obtain a graphic record of the rate of flow in standard units is a most important feature, and very valuable to an operator who has once formed the habit of using the information which can be obtained from it. The variations in the rate of flow at points between the generating plant and the holder are usually small; but even here the irregularities which appear on the chart are of value in tracing irregular plant operation. The variations in flow between the storage holders and the consumers are of very considerable magnitude, and graphic charts of them are extremely interesting; and their value, which is already coming to be appreciated, must increase with the growth of distributing systems.

[The author gave several reproductions of charts taken from Thomas meters, and offered some explanatory remarks thereon.]

LEAD BURNING BY TOWN GAS.

About a year ago, Mr. Walter L. Thompson, of the New York Service Station of the Philadelphia Storage Battery Company, installed the first experimental plant for lead burning for the manufacture and repair of electric storage batteries, using ordinary gas in connection with compressed air admixed with a certain percentage of oxygen. The service of this first installation proved successful from a technical as well as from an economical standpoint. The management of the Philadelphia works of the same Company quickly saw the advantages to be obtained by the use of ordinary gas as compared with hydrogen, and decided to erect a large installation of this kind for the manufacture of storage batteries. A photograph of it is given in the "Bulletin" of the American Commercial Gas Association for the current month.

The old method of lead burning by the use of hydrogen and compressed air developed many detrimental features which are eliminated by the use of illuminating gas. In American cities where Municipal Explosive Commissions and the National Board of Fire Underwriters curtail the installation of generators, tank service, besides being very cumbersome, is extremely expensive. Data are available showing where approximately monthly costs of $175 for tank service have been reduced to less than $40 by the use of city gas in connection with pure oxygen, where such smaller installations were made on account of the lower initial expense of installation, eliminating the compressed air feature.

Data for the installation illustrated in the "Bulletin," fitted up where, for large manufacturing purposes, generators were previously used, show that a cost of approximately $160 per month has been reduced to less than $60 for an 18 to 20 burner plant. But in the figure of $160 only the actual outlay for material has been calculated upon, and not the labour for cleaning the generators, and the work and danger connected therewith.

Mr. A. S. B. LITTLE, the General Manager of the Consolidated Gas Purification and Chemical Company and the Atlas Paint Company, of Nashville (Tenn.), has sent in his resignation. His object in severing his connection with these Companies was, we understand, a desire to return to the gas business; and he has been engaged by the Public Utilities Commission of Illinois.

TEMPERATURE CONDITIONS IN COKE-OVENS.

An important contribution to the literature of carbonization in coke-ovens has lately been made in "Stahl und Eisen" by Professor Oskar Simmersbach, of Breslau. The experiments were carried out in a Koppers regenerative oven, and the temperature conditions existing during the period of carbonization and the composition of the volatile products were carefully determined The following abstract of the article, with the tables, has appeared in the "Engineering Review."

The oven was charged with 8¾ tons of coal containing 22·7 per cent. of volatile matter, 6·32 per cent. of ash, and 12·1 per cent. of water. This yielded 79·86 per cent. of coke. The coal was carbonized for a period of 29 hours. The temperature rose gradually during this period; the concluding readings being 1090° C. at one-fourth the distance from the charging side, 1120° C. in the centre, and 920° C. at one-fourth the distance from the discharging side. These temperatures correspond to the centre of the carbonized mass. In the gas space above the coal, the finishing temperatures were respectively 870°, 860°, and 810° C. The resulting coke contained 88·53 per cent. of carbon, 2·56 per cent. of volatile matter, and 8·91 per cent. of ash. The figures (volume per cent.) showing the composition of the gas at various periods during carbonization are reproduced in the following tables:

Hours Coal Carbonized . . .	2	3	4	5	6	7	8	9	10	11
CO_2	3·30	3·0	2·3	2·5	2·2	2·00	1·40	1·90	2·30	1·30
C_6H_6	1·80	1·5	1·1	1·1	1·0	0·80	0·60	0·50	0·35	0·35
C_2H_4	4·00	3·5	3·1	3·2	2·8	2·50	2·50	2·00	1·75	2·05
O_2	1·05	0·8	0·6	0·6	0·5	0·50	0·20	0·20	0·20	0·10
CO	0·90	1·9	2·9	2·8	3·0	3·95	3·40	3 10	2·80	2·80
CH_4	36·65	36·1	34·5	34·5	33·6	32·40	33·65	33·45	31·20	32·40
H_2	42·50	44·6	48·8	47·8	50·1	50·75	53·75	50·55	47·10	51·50
N_2	10·00	8·6	6·7	7·5	6·8	7·10	3·60	8·30	14·30	9·50
Min. cal. power (0° C., 760 mm.), calculated per cubic metre. .	5402	5271	5086	5071	4971	4802	4906	4797	4324	4583

Hours Coal Carbonized . . .	12	13	15	17	19	21	23	25	27	Heating Gas.
CO_2	1·50	2·00	1·90	1·80	1·10	1·05	0·80	0·7	1·0	2·1
C_6H_6	0·35	0·30	0·25	0·10	..	..	..	..	..	..
C_2H_4	1·85	1·80	1·80	1·90	1·20	1·00	0·60	0·3	0·3	1·8
O_2	0·20	0·20	0·15	0·25	0·15	0·05	0·05	0·1	0·3	0·6
CO	4·15	4·10	3·90	4·15	4·70	4·00	3·80	4·9	5·8	4·2
CH_4	33·40	32·45	33·20	30·60	26·10	21·15	18·95	12·2	4·7	26·2
H_2	50·65	49·75	53·40	51·60	55·75	58·95	61·90	67·0	70·0	51·7
N_2	7·90	9·40	5·40	8·60	11·00	13·80	13·90	14·8	17·9	15·4
Min. cal. power (0° C., 760 mm.), calculated per cubic metre. .	4660	4530	4665	4369	3978	4487	3412	2960	2419	3964

The author also gave in "Stahl und Eisen" the results of his investigations into the distribution of nitrogen between coke, tar, ammonia, hydrogen, cyanide, and free nitrogen in the gas at varying temperatures of distillation. He also carried out experiments on the decomposition of ammonia, in contact with coke at different temperatures, into its elements and to form hydrogen cyanide. According to an abstract in the "Journal of the Society of Chemical Industry," in the distillation of coal the formation of ammonia occurs mainly at a temperature higher than that at which coking takes place. The temperature of maximum ammonia formation is not the same for all coals, but varies between 800° and 900° C. The thermal decomposition of ammonia, which in the case of the pure gas starts at about 750° C., and is very rapid at 800° C., is not appreciable below 900° C. in the conditions of dilution obtained during the distillation of coal. The hydrogen cyanide formed in distillation increases with the amount of ammonia and with rise of temperature, though when pure ammonia is heated with coke it reaches a maximum at 900° C. The hydrogen cyanide obtained is usually about 1·2 per cent. of the total nitrogen in the coal and 5 per cent. of the ammonia formed. Water vapour reduces the cyanide yield, and improves that of ammonia; while high velocity of the gas has the reverse effect. The degree of subdivision of the coal has not much effect on the yield of ammonia or on the temperature at which the best yield is obtained.

Solubility in Water of Nitrate Compounds of Calcium Cyanamide.—According to Sig. C. Manuelli, as quoted in the "Chemical News," the nitrate compounds of calcium cyanamide dissolve rapidly in water, and after an hour 80 per cent. of the total nitrogen has passed into solution. After the first hour, solution proceeds only very slowly, and at the end of six hours 88 per cent. and after eight hours 90 per cent. of the total nitrogen is dissolved. The quantity of nitrate dissolved then diminishes slightly, evidently owing to transformation of cyanamide into comparatively insoluble dicyanamide.

REGISTER OF PATENTS.

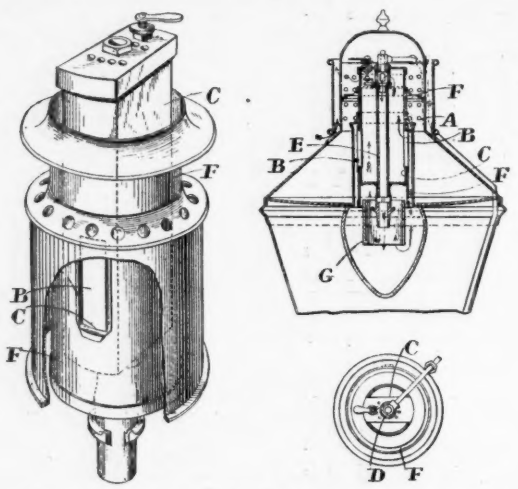
Incandescent Gas-Lamps.

BRITISH GRAETZIN LIGHT, LIMITED, and MEADS, H. J., of Chapter Street, Westminster.

No. 14,567; June 24, 1913. Redated, Dec. 24, 1913.

The type of lamp to which this invention applies is that in which a cylindrical chimney for the hot gases of combustion is provided, having outlets near the top, and an air-shaft is mounted within it, having near the bottom inlets which open out through the walls of the chimney so that the air can pass through the walls of the chimney without entering the chimney and into the air-shaft, and has to travel up through the air-shaft before it can enter the gas-pipe, which again is concentric with the air-shaft. Thus both the incoming air and the gas become heated by the hot gases of combustion rising through the chimney.

The invention relates to various constructional details of such a lamp. One feature consists in the provision of a baffle round the inlets for air which extend through the chimney and the air-shaft; this baffle being open at both ends to conduct the incoming air down past the hot walls of the chimney to the inlet passages, and also to the burner-mouth. Yet another feature relates to the provision of a lateral baffle, whereby a perforated extension of the hood round the chimney is divided into two parts, so that the exhaust gases escaping from the upper part are prevented from mingling with the air which enters by the lower part. Moreover, this baffle may be used to support the whole of the parts built together with the chimney.



Meads' (British Graetzin Light) Incandescent Gas-Lamp.

A perspective view of the burner of the lamp is given; also a vertical section through the lamp with the burner in place, and a plan of the lamp centre.

The air enters by the orifices A, and passing through the perforated flange is divided into two streams, one of which enters the orifices B and travels upward through the shaft B and bunsen-fitting D into the gas-conduit E, and thence to the burner-nozzle. The other stream passes down between the outer wall of the chimney and the inner wall of a cylindrical baffle into the globe, where it helps to maintain combustion at the burner. The hot exhaust gases generated at the burner pass up through the glass chimney G into the cylindrical chimney F, round outside the air-shaft C, and out by the perforations at the top of the cylindrical extension of the hood of the lamp. The upward rush of hot gases through the chimney G ensures that air will be drawn freely through the inlets A and the perforated flange to supply the burner, both through the conduit E and from outside by way of the globe. The air which traverses up through the shaft C is heated by the temperature at which the shaft is maintained through the hot gases traversing the chimney outside it, and the air which passes into the globe is heated by contact with the exterior of the chimney as it passes down to the globe.

The whole burner can be lifted out by swinging-back the hinged cover, as all the parts are made of such dimensions as to pass freely through the internal flange.

The air-shaft C is practically sealed—in fact, it is sealed against any entrance of exhaust gases. The bottom is sealed by a solid plate, and the top is sealed by a plate which may be solid but, preferably, has in it the small orifices already referred to. It is found that when a few orifices are thus provided a better action is obtained, as by this means the incoming air is more readily induced to travel up the shaft C and a constant stream passes out through the orifices, so that no exhaust gases can pass in through these orifices, and yet a good supply is maintained to the gas-conduit E.

Regenerator Settings for Vertical Retorts.

GLOVER, S., of St. Helens, and WEST, J., of Southport.

No. 18,599; Aug. 15, 1913.

This invention has for its object "to provide, in a retort-setting of the type in which a plurality of separate or independent combustion chambers are arranged around the retorts, and in which the secondary air required for complete combustion in the chambers is heated in chambers around the lower ends of the retorts, means providing an independent supply of coal gas to each of the combustion chambers for obtaining the desired temperature or temperatures therein, and means for preheating said gas supply."

Fig. 1 is a sectional elevation of a vertical-retort setting arrangedin accordance with the invention. Fig. 2 is a sectional plan on the line X. Fig. 3 is a sectional plan on the line Y.

The vertical retorts A are arranged separately or in groups in the setting B, which is divided into a plurality of horizontal chambers C, each one of which forms a separate combustion chamber. Vertical partitions D may divide the horizontal chambers into a plurality of compartments, each having air and fuel inlets E F respectively, for combustion purposes, and through each of which one or more retorts

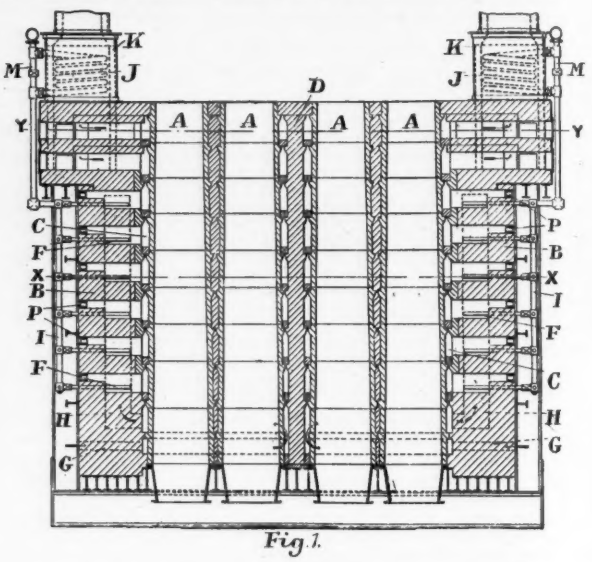


Fig. 1.

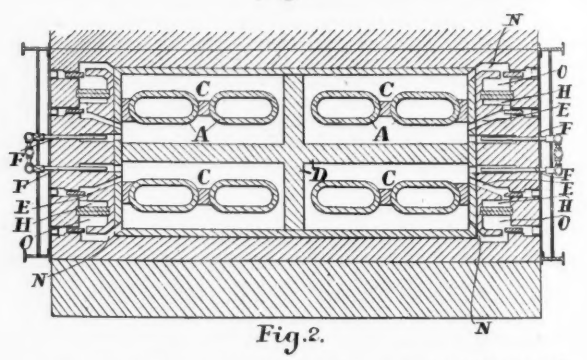


Fig. 2.

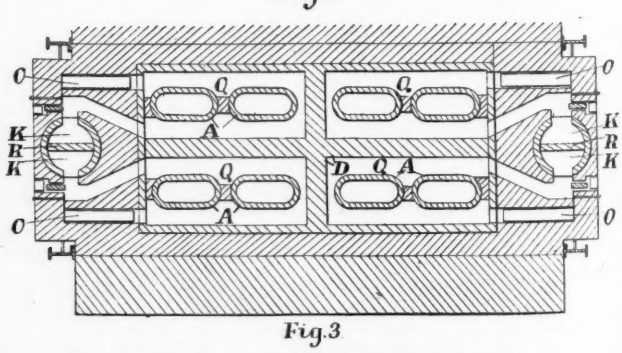


Fig. 3

Glover and West's Regenerator Setting for Vertical Retorts.

pass. The secondary air required for complete combustion in the chambers is drawn from the inlets G, and is conducted, by the two lower horizontal chambers indicated by the arrows, to the vertical air passages H leading to the combustion chamber air inlets E. The air abstracts heat from the hot coke just prior to its discharge from the retorts.

The coal gas required for combustion is supplied under pressure to mains I having branches leading to each combustion chamber C; the gas in its passage to the mains being passed through a heater J, preferably comprising coils disposed around the inside of the waste flue K from the retort-setting. The gas is therefore heated by the waste heat in the chimney before it is projected into the combustion chambers adjacent to the heated secondary air flues E. Valves or cocks are provided for regulating the supply of gas to each combustion chamber, and a bye-pass or passage M may be employed so that, if desired, the preheating of the coal gas may be dispensed with.

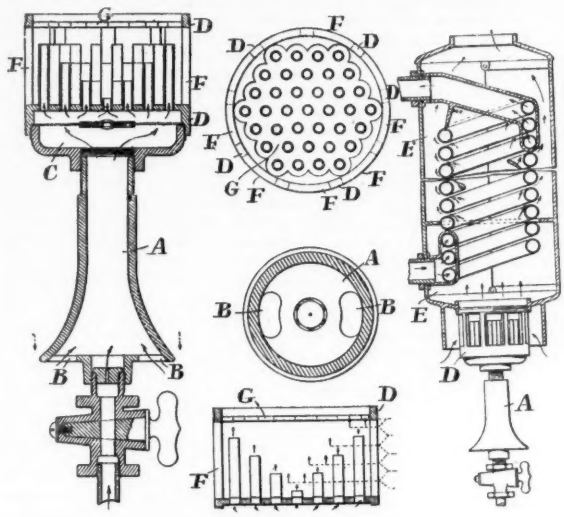
The products of combustion from the chambers C travel, by way of the ports N, to the ascension conduits O, leading, by way of the two upper rows of horizontal chambers G (one of which is shown in fig. 3), to the chimneys K. A division piece R in each chimney ensures uniformity of draught in the chambers. Sighting or inspection caps and apertures for the combustion chambers are indicated at P.

Gas-Burners.

ACKROYD, J. H., of Elizabeth, New Jersey (U.S.A.).

No. 25,067; Nov. 3, 1913.

This invention relates to gas-burners of the type in which the burner head comprises a plurality of individual small tubes for the outlet of the combustible mixture. Such burners are adapted for various uses in which a high temperature is necessary or desirable, as in mantle lamps and in various types of heaters, ovens, and furnaces. The objects aimed at are "to provide a simple, durable, and inexpensive burner of the above kind, which will produce complete combustion of the gas used, in which the parts will not become unduly heated, in which there will be no suction on the burner orifices, and consequently the mixture of gas and air in the mixing-chamber will remain unchanged, and jumping-back of the flame will be prevented, and which will develop a maximum temperature with a minimum amount of cross sectional area."



Ackroyd's Gas-Burner.

The illustration shows a sectional elevation of the burner, a plan view, a section looking in the direction of the arrows at the bottom of the bell-shaped tube A, and a section of the frame showing the heights of the sets of burner tubes and showing diagrammatically the paths of the lateral air currents. It also shows the application of the invention to a water-heater.

Above the gas supply pipe, and secured to it, is a tube A, having air inlets B, by which gas and air is conducted to a mixing-chamber C. Within this chamber is a diaphragm carrying a central baffle-plate, which deflects the air and gas and causes it to be thoroughly mixed. Above the mixing-chamber, and secured to it, is a frame D, which supports a heating-chamber E. Burner tubes, secured in the bottom plate of the frame, opening into the mixing-chamber, and extending upward within the frame, are of progressively varying heights. At the centre is preferably a single tube, which is shortest, surrounded by series of higher and still higher tubes. The tubes in each series are of the same height, and there is a uniform difference in the heights of the several series. An important feature of the invention is that all the tubes are placed at substantially uniform distances apart.

The frame is provided with lateral air inlets F, which extend substantially the whole height of the frame and are of ample size and number to supply any quantity of air that can possibly be required. These inlets extend from the tops of the lowest burner tubes to above the tops of the highest burner tubes. The effect is to permit the air which is required to supply the draught of the heating-chamber to flow laterally inward thereto above the level of the respective burner orifices and in contact with the flame surfaces, "so that the draught of the heating-chamber cannot produce a suction upon the burner orifices, inasmuch as they are located below the lateral air supply."

The vital feature of the air inlets is that they extend down to the level of the tops—*i.e.*, the burner orifices—of the shortest burner tubes, and extend above the level of the tops of the highest burner tubes, so as to provide ample lateral air currents above all of the burner orifices to support combustion. The effect of this arrangement of air supply is to prevent the possibility of the heating-chamber exerting any suction upon any of the burner tubes; and by placing all of the tubes at uniform distances apart, and providing ample air inlet openings in the frame, it is insured that each flame shall be surrounded by an equal volume of air. By making the central tube or tubes lowest and the surrounding series of tubes of progressively increasing height from the centre outward, an ample lateral air supply to the flames is secured above all the burner orifices under all conditions of use.

Combustion takes place within the frame at the upper ends of the burner tubes, and the flames pass through an opening G into the heating-chamber, where the combustion of the mixed air and gas is completed. It will be noted, in the arrangement of burner tubes shown, that certain of the tubes in the outer series are at a greater distance than others from the outside of the frame. In order to prevent a thicker sheet of air from passing to the heating-chamber surrounding the flame from these tubes, there is a flange at the top of the frame which extends inward, and is curved to correspond with the curvature of the tubes and leave a space between the flange and the tubes equal to half of the distance between one tube and another. There is thus insured that the sheets of air surrounding the flames from these tubes and passing to the heating-chamber shall be no thicker than the sheets of air surrounding the flames from the other tubes in the several series.

Producing Combustible Gases.

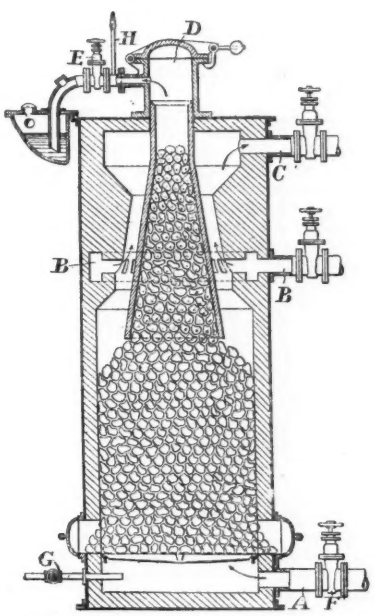
STRACHE, H., of Vienna.

No. 5730; March 6, 1914. Convention date, Jan. 13, 1914.

The patentee remarks that, in the hitherto known methods of producing water gas and coal gas in one and the same apparatus—comprising a producer having a retort in its upper part—the coal gas produced in the upper part of the producer by hot blasting the lower part is obtained by adjusting the closure members provided on the hot-blast piping discharge conduit and gas discharge conduit; the pressure between the exhaust gases and the coal gas being balanced so that a circulation of the hot blast gases upwardly into the retort and a circulation in a downward direction of the coal gas produced in the retort cannot take place. This method has the drawback that, with the slightest variation in pressure, a variation in the throttling must also take place which, by means of an automatic controller, can be effected in an imperfect manner only.

The present invention relates to the production of producer gas consisting of a mixture of coal gas and water gas in such a manner that during the major portion of the duration of the hot blasting the gas discharge from the retort is completely shut off and the dimensions of the space remaining free above the coal are selected in such a manner that the coal gas produced during the hot blasting operation can accumulate therein. The latter is lighter than the hot blast gases (carbon monoxide, carbonic acid gas, and nitrogen) and therefore accumulates in the upper part of the distilling chamber, and would escape from the lower part of the chamber into the heating conduits if the chamber and the space above it were completely filled with coal gas. If the dimensions of these spaces are sufficiently large, an escape of coal gas is avoided. During the ensuing period of production of water gas, the coal gas accumulated in the chamber is forced into the system by the coming current of water gas, and is thus obtained.

When commencing hot blasting again the chamber and the free space above it are filled with a mixture of coal gas and water gas. In order to obtain this mixture as well, the gas exhaust valve in the upper chamber is left open during the first moment of the hot blasting, and is closed when the mixture of coal gas and water gas is forced from the chamber by the hot blast. During the subsequent period of hot blasting the gases of the latter are again forced out by the coal gas, when the valve is closed, as previously explained, and the cycle begins once more.



Strache's Producer for Combustible Gases.

The illustration shows the application of this method to a gas-producer. The lower portion of the producer is filled with coke, and in the distilling chamber placed above, coal is located. By blowing air through the pipe A underneath the producer grate, the column of coke is heated until it glows; the produced carbon monoxide being burned by blowing additional air through B. The combustion gases surround the distilling chamber and escape through the open valve C to the chimney. Above the coal there is a free space D, which is gradually filled with the distillation products which drive the heavier combustion gases lying in the interstices between the coal in a downward direction, so that they also escape from the lower part of the distilling chamber to the heating conduits.

The dimensions of the free space above the coal and the dimensions of the distilling chamber are selected in such a manner that during the duration of the hot blasting these chambers are filled with coal gas. The gas outlet valve E is closed during this period of hot blasting. Subsequently the draught inlet valve F in the pipe A is closed, and steam is admitted through the pipe G. The valve on C is also closed and the gas outlet valve E opened.

The water gas produced in the lower part of the producer passes through the distilling chamber, and therefore displaces the distillation gases accumulated there, through the valve E, into the system. During this time, the distillation of the coal continues, as it is still heated by the hot water gas. In the distilling chamber and in the space above the coal, there is, at the end of the gas period, a mixture of water gas and coal gas. When hot blasting again, the chimney valve on C and

the draught inlet valve F are opened. The gas outlet valve E still remains open until the water gas and the distillation gases are displaced from the distilling chamber and from the space above the coal. This is ascertained by test flame, which is provided at H, which goes out as soon as the combustion gases leave the chamber. At this moment, the valve E is closed so that the space above the coal and the distilling chamber are filled again with fresh distillation gases, as explained in connection with the first hot blasting.

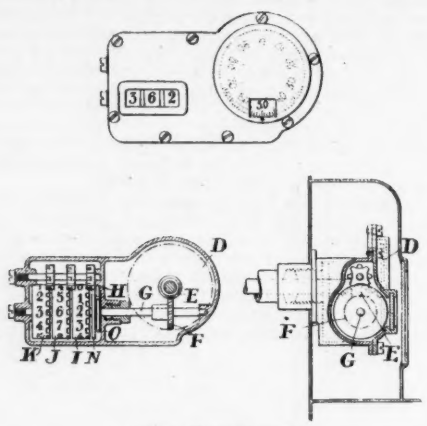
Registering Mechanism for Meters.

COMPAGNIE POUR LA FABRICATION DES COMPTEURS ET MATERIEL D'USINES À GAZ, of Paris.

No. 16,919; July 23, 1913. Convention date, Aug. 3, 1912.

This invention relates to gas-meters of the kind in which the registering mechanism is operated by a spring, so that the parts carrrying the figures jump rapidly from one reading position to the next.

A front elevation of one construction is given; also a vertical section of same (the front wall of the case being removed), and a cross section.



A French Meter Counter.

The whole of the delicate portion of the apparatus is contained in a completely closed casing comprising an air-tight glass in front of the windows. The spindle of the measuring part controlling the mechanism passes through a stuffing-box in the wall—a long sleeve and a ball-and-socket joint or any other packing system being used to ensure an air-tight joint. The spindle carries, on the one hand, at its end, the figure disc D used in the gas-meters and, on the other hand, beyond the disc, a worm E driving, by means of a worm wheel F, the figure drums of the counting mechanism. The spindle G of the wheel F is of a comparatively small diameter, and passes through a tight joint in a partition H dividing the casing into two compartments, in which are arranged respectively the control disc D and the adding drums I, J, K. The unit drum I is actuated by any suitable quick action or snap device—such as a disc N provided with a pin and a spring O mounted on the spindle G. The figures of the disc appear successively through a window provided with glass, while the figures of the drums appear at another window, also provided with glass. The whole of the case can be arranged in a box of the meter, intended to protect the glasses of the windows from moisture and dust.

APPLICATIONS FOR LETTERS PATENT.

18,489.—WILLIAMS, D., "Smokeless fuel." Aug. 10.

18,490.—ROLLASTON, A., "Production of light oils from carbonaceous substances." Aug. 10.

18,504.—CARPENTER, C. C., "Electric igniting-apparatus for gas-burners." Aug. 10.

18,558.—RIGBY, T., and WETCARBONIZING, Limited, "Ammonia compounds." Aug. 11.

18,559.—RIGBY, T., and WETCARBONIZING, Limited, "Bye-product recovery from gases." Aug. 11.

18,563.—KING, L. V., "Determining the rate of flow of fluids." Aug. 11.

18,576.—HILLS, H. G., and THOM, R. W., "Distillation of carbonaceous materials." Aug. 12.

18,581.—ANTROBUS, W., "Treatment of fuels for obtaining bye-products therefrom." Aug. 12.

18,669.—KEITH, J. & G., "Gas-lamps." Aug. 14.

18,671.—BEST, F. B., "Surprise pendants." Aug. 14.

18,680.—SMITH, E. W., "Diaphragms of meters." Aug. 14.

Wolverhampton Gas Company.—The report of the Directors for presentation at the half-yearly meeting of the Company shows a net profit of £9537. This, added to the balance brought forward, enables the Directors to recommend the payment of dividends at the same rate as last half year—viz., 3 per cent. upon the preference stock, 5¼ per cent. upon the consolidated stock, and 3⅛ per cent. upon the new ordinary stock, less income-tax, and to carry the balance of the excess dividend undivided (£459) to the reserve fund, as authorized by the Act. They further recommend that £417, interest for the half year, be placed to the credit of the reserve fund, and likewise £56 like interest to the credit of the insurance fund, and that the balance of £26,052 be carried forward to the next account.

MISCELLANEOUS NEWS.

LIVERPOOL UNITED GAS COMPANY.

Larger Sales of Gas.

The Half-Yearly General Meeting of this Company was held last Tuesday—Mr. H. WADE DEACON (the Chairman) presiding.

The Directors reported that the revenue for the year ended the 30th of June was £729,750, and the expenditure £640,831; leaving a surplus of £88,919. The amount available for distribution was £59,438; and they recommended the payment of dividends for the half year of 5 per cent. on the ordinary consolidated "A" stock and 3½ per cent. on the 7 per cent. "B" stock.

The CHAIRMAN, in moving the adoption of the report and accounts, said they had met under very trying conditions from a national point of view, which made it absolutely uncertain as to what the future of the country would be. A large number of their own men had been called to the Colours, and they all desired most heartily that these men might come through with honour to themselves and credit to the country. It was the duty of the Directors to make some provision for the dependants of those who had been called up; and this they might rest assured would be done. The Directors had considered on several occasions the question of the issue of the unissued debenture and "B" stock, and had decided to wait for what they hoped would be a more favourable opportunity. Unfortunately, as all now knew, the war had upset all calculations, and it was useless to attempt an issue of stock at the present time. Therefore, they would have to wait, and in the meantime make such arrangements as occasion required. The shareholders would be interested to know that the capital expenditure per million cubic feet of gas sold per annum stood at a low figure; being £413, as against £521 ten years ago. The outstanding feature of expenditure in the revenue account was the largely increased cost of coal and oil, which amounted to £48,336. For the present year they had been able to buy at considerably lower prices; but as they now had to carry large stocks, and incidentally lock-up a good deal of capital, in order to provide against unforeseen contingencies, the full effect of the lower prices would not be felt immediately. There was a reduction of £8066 in rates and taxes. The Directors considered that the assessments made upon the property of the Company were too high, and lodged appeals. By agreement with the Assessment Committees, the matter was referred to arbitration; and the result was that the assessments were reduced, and the effect was seen in the large reduction in rates for the year. The sales of gas were higher through both ordinary and prepayment meters; and to some extent this was due, no doubt, to the increased use of gas fires and cookers. The prices obtained for coke and ammoniacal liquor had been disappointing. For the first time in the experience of those long connected with the gas industry, the increased price of coal had not been followed by an increase in the price of coke. This was an important matter, and efforts were being made to bring coke into more common domestic use. Locally, their coke would be more useful for this purpose than it had been hitherto, as under the new methods of working no cannel would be necessary, and the quality of the coke would be improved. A year ago, after paying the dividend, there was a balance of £31,308 to the credit of the net revenue account, and the Directors decided not to increase the price of gas but to use the balance to meet the estimated deficiency. The net deficiency for the past year was £25,064—rather less than was estimated—and the result was that there was now a surplus of £6255 to carry to the next account. The Directors had carefully considered an estimate for the current half year; and though it was quite impossible under present conditions to frame any estimate that could be absolutely relied upon, they were so convinced of the necessity of providing cheap gas in order to meet increasing competition, that they had decided not to alter the price at present, at all events. He next referred to the Company's Bill that was brought before Parliament, and said the Directors had pleasure in acknowledging their indebtedness to the local Members of Parliament and others who had helped them. The Committee of the co-partnership scheme were greatly interested in the Bill; and the members of this Committee, by writing to their local Members of Parliament urging them to support it, did much to secure its passing.

The DEPUTY-CHAIRMAN (Mr. J. Ernest Tinne) seconded, and the report and accounts were adopted.

Mr. G. H. BALL advanced the contention that the price of gas was too low, and that in consequence a considerable amount of money was being lost. He claimed that if the Company adhered to this policy they would get into a very bad financial position.

The CHAIRMAN, in reply, said that, with the exception of Mr. Ball, the Directors had been perfectly unanimous with regard to the present policy. When the Bill was before Parliament, they were perfectly satisfied that they would not get it through if they adhered to the maximum dividend. It was necessary to have an Act, because they wanted money; and it was very fortunate now that they had the Act. The Directors took the very best advice with regard to the sliding-scale. As for the loss on the price of gas, there would be no loss, apart from the war, during the next half year.

Mr. T. Fell Abraham was re-elected Auditor; and the thanks of the meeting were given to the Chairman and Directors for their satisfactory management of the Company's affairs.

The accounts accompanying the report of the Directors show that the total paid-up capital, including premiums, on the 30th of June was £1,650,665, out of £1,719,548 authorized; leaving £68,883 remaining to be issued. The amount raised on loan at the same date, including premiums, was £336,309, out of £380,000 authorized; leaving £43,691 unissued. The capital account shows that £1,986,974 has been raised, and £2,093,267 spent; showing an over-expenditure of £106,293. In the course of the year, a sum of £49,543 was laid out for new buildings, plant, &c., new mains and service-pipes, meters,

cookers, and fires. But from this total is deducted £10,283 for depreciation of cookers, fires, and meters condemned or destroyed; bringing the amount down to £39,260. The reserve fund stood at £125,000, and the co-partnership bonus and savings at £25,462 at the close of the year. The following is the

REVENUE ACCOUNT.

Expenditure.

Year to June 30, 1913.		£ s. d.	£ s. d.
	Manufacture of gas—		
	Coals, including oil, dues, carriage, unloading, and all expenses of depositing same on works	314,671 9 7	
£296,335	Purifying materials; water, and sundries	15,760 4 6	
13 6,6	Salaries of Engineers and Superintendents and officers at works	8,973 11 10	
8,405	Wages and gratuities at works	47,0.9 10 0	
46,503	Repairs and maintenance of works and plant (including renewal of retorts), machines, apparatus, tools, materials and labour, *less* old materials	73,286 16 8	
73,8:6			489,731 12 7
£438,815	Distribution of gas—		
	Salaries of Surveyors, Chief Inspector, Inspectors, Assistant Inspectors, &c.	13,173 1 7	
13,322	Repair, maintenance, and renewal of mains and service pipes, including materials, laying, paving, and labour	21,5:8 2 11	
19,863	Repairing, renewing, & refixing meters	22,526 5 2	
22,918	,, ,, ,, fires and cookers	21,119 14 6	
21,7:0			78,177 4 2
	Public lamps—		
1,676	Lighting and repairing	..	1,727 5 1
	Rates, taxes, and rents—		
699	Rents	694 4 6	
35,184	Rates and taxes	27 117 10 6	
			27,811 15 0
	Management—		
1,200	Directors' allowances	1,200 0 0	
	Salaries of Secretary, Accountant, and		
9,033	clerks, office keepers, and messengers	8,939 11 5	
7,921	Collectors' commission and salaries	7,861 15 4	
3,038	Printing, stationery, and advertising	3,109 3 9	
	General establishment charges and in-		
3,388	cidentals	3,101 14 6	
158	Official Auditor	157 10 0	
21	Shareholders' Auditors	21 0 0	
			24,390 15 0
	Special charges—		
14	Law and Parliamentary charges	1,2?2 9 2	
	Contributions to officials' superannuation fund	3,254 11 6	
3,149	Moiety of superannuation to old officials	3,492 9 1	
3,515	Co-partnership bonus	8,372 9 8	
7,?17	Bad debts	342 10 8	
351	Insurances and compensations	2,248 0 1	
1,884			18,992 10 2
£595,676			640,831 2 0
104,156	Balance carried to net revenue account		88,919 12 1
£699,832			729,750 14 1

Income.

Year to June 30, 1913.		£ s. d.	£ s. d.
	Sale of gas—		
	Per ordinary meters at 2s. 1d. per 1000 cubic feet	381,109 15 5	
£374,637	Per automatic meters at 2s. 8d. per 1000 cubic feet	152,079 10 7	
129,507	Public lighting at 1s. 10 5d. per 1000 cubic feet	24,688 2 2	
24,296			557,877 8 2
£528,440			
12,046	Rental of meters	12,?94 19 3	
7,818	,, fires and cookers	10,686 9 9	
	Residual products—		
80,307	Coke (*Less* expenses)	78,564 18 1	
34,288	Tar ,, ,,	35,325 16 11	
34,781	Ammoniacal liquor ,, ,,	30,975 18 4	
2,052	Other products ,, ,,	1,970 19 1	
			22.981 9 0
100	Rents	. . .	100 0 0
	Fittings	. . .	1,954 4 6
			146,837 12 5
£699,832			729,750 14 1

The following statements relate to the working :—

Statement of Coal and Oil.

Description.	In Store June 30, 1913.	Received During Year.	Carbonized or Used During Year.	In Store June 30, 1914.
	Tons.	Tons.	Tons.	Tons.
Common	45,726	238,927	241,324	43,329
Cannel	4,186	48,399	51,683	902
Total	49,912	287,326	293,007	44,231
Gas oil—gallons	811,249	5,043,247	5,775,053	79,443

Statement of Residual Products.

Description.	In Store June 30, 1913 (Estimated).	Made during Year (Estimated).	Used in Manufacture during Year (Estimated).	Sold during Year.	In Store June 30, 1914 (Estimated).
Coke—tons	2,259	189,782	49,541	133,708	8,792
Tar—gallons	180,333	4,808,812	9,045	4,780,851	199,249
Ammoniacal liquor—gallons	383,551	8,253,801	*Nil*	8,255,693	381,659

WANDSWORTH, WIMBLEDON, AND EPSOM GAS COMPANY.

The Half-Yearly Meeting of the Company was held last Tuesday, at the Westminster Palace Hotel, Victoria Street, S.W.—Mr. H. E. JONES in the chair.

The SECRETARY (Mr. C. W. Braine) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

THE WAR AND THE MEN.

The CHAIRMAN, in moving the adoption of the report and accounts, said that no one could address a meeting of any number of Britishers at the present time without feeling impressed with the serious condition of things under which the country as a whole and its industries were being carried on. It was idle to say that this did not cause them all a great deal of anxiety and trouble. Their ships had been running with difficulty; but it was less of the immediate worries and frettings of the staff and himself to which he would allude than to the grave dislocation which the war meant in all their methods, systems, and routine, and the serious anxiety with which it surrounded their work. The proprietors would be glad to hear that 73 of the Company's employees had gone to the war, and that notices were daily being received of further volunteers. The Directors had come to the conclusion (which he knew the proprietors would approve) that they would give these gallant fellows the comfort of knowing that their dependants—wives, children, and parents—would have half their pay during their absence; and the Directors had extended this to any man who, though not called out, might wish to go as a volunteer.

NATIONAL RELIEF AND THE RESERVE FUND.

There was another matter. They had no power under their Acts of Parliament to vote funds for the relief of need. They could behave well and kindly (as they always endeavoured to do) to their own servants; but so earnestly did he feel the necessity that they should all put their shoulders to the wheel, and do the best they could individually and collectively, that the matter of a contribution to the general relief fund was one which he thought must be considered by their Company. In this connection, however, it might be necessary to call the proprietors together at some future date. But the question could not be dealt with that day, because it was not upon the notice convening the meeting. But it seemed clear that they could not subscribe out of the general funds of the Company to any relief fund, because the stockholders were partners with the consumers; and, therefore, the Directors might have to ask the proprietors to authorize the appropriation as a contribution to the relief fund of some part of the reserve which had been accumulated to protect the dividend. [Hear, hear.] He had not the sanction of his colleagues to make any suggestion; and really they had not yet discussed the matter at any length. But he gathered from the murmur of approbation that, if the Board did call the proprietors together for the purpose suggested, they would release such a contribution from the funds as should go from an important Company like theirs to increase the benevolent fund now being raised in the Metropolis and the country generally. [Hear, hear.]

THE DIVIDEND AND THE UPKEEP OF PLANT.

The report informed the proprietors that the accounts showed a balance, and that the Board recommended the full dividends allowed by Statute. As a matter of fact, the deficit on account of the half year was some £4200. But inasmuch as, for a Company of this scale, the sum required for dividend was not a considerable one, there had been no hesitation on the part of the Directors to recommend the proprietors to take the full dividend. The deficiency of £4200 had only been arrived at after the fullest expenditure on upkeep had been made. He was always harping upon the principle that the upkeep of an undertaking must be provided for before any sort of dividend was declared. When he said that the expenditure on upkeep in their case amounted to more than 9d. per 1000 cubic feet, the proprietors would know that here they had the dividend well earned.

THE WAR AND THE PAYMENT OF DIVIDENDS.

With regard to the payment of the dividends, he had received several letters of contrary purpose. Some suggested it was a bad time to pay dividends, and that they ought to hoard up the money, seeing that the country might be in need of it if the war went on for long. He had received other letters (with which the Board sympathized) urging that there should be no hoarding even of dividends. The payment of the dividends was merely a transfer from the Company's bank, where it was lying safely enough to meet the dividend warrants, into the proprietors' own banks; and ultimately it would go to the Bank of England. This was keeping the money in the country; and it would be hard lines upon trade which depended upon them as individuals if they had to hold over the payment of their private accounts because they could not get the dividends upon their investments.

INCREASED BUSINESS, CAPITAL, AND REVENUE.

The report gave the key to the whole prosperity to which they owed this dividend. There had been an increase of 7·9 per cent. in the sale of gas. This increase, coupled with the fact that, owing to the economical manner in which the capital had been spent in the past—partly due to good engineering, and partly due to good accountancy, which saw that every maintenance charge was properly placed to upkeep, and not to capital—something like 6d. per 1000 cubic feet was all they required for dividend, and this enabled the Board to pay the full dividend out of a relatively small amount of profit. Most people who understood gas accounts and gas practice were concerned to know how far capital and revenue drew together. Regarding the capital account, they had an increase of business of, in round figures, 8 per cent.; and it would be seen that they were adding £27,500 to a capital of £858,920. Thus while they were only adding slightly over 3 per cent. to the capital, they were adding to the business 8 per cent. This, to a business man, would show that they were on the lines of improving even the fine and prosperous condition which the Company already enjoyed. Then from the revenue account, it would be seen that the profit of £30,149 was the sum which formed the bulk of the dividend recommended. This had been arrived at after paying something like £12,000

more for coal, and receiving more than £6000 less for residuals—making £18,000 to the bad. Against this the extra sale of gas had given them £12,000; reducing the £18,000 to £6000. This was practically the £4220 by which they were deficient of the requisite sum for the dividend, save for about £2000 of economies scattered through the expenditure. This was by far a less proportionate deficit than had been announced from the chair of any other Metropolitan gas company in respect of the last half year.

THE RESIDUALS.

This issue had not been arrived at without the best results being obtained by the Company's staff. The results in coke sold, tar, and sulphate of ammonia were all first-class. The quantity of coke sold was swollen by the fact that the modern furnaces for carbonizing the coal only consumed 16 per cent. of fuel, whereas the old-fashioned ones which were still in use by some companies consumed as much as 30 per cent. This led him to the point that, of course, the extra saving of coke and the extra gas that had to be made to meet the demand gave them more coke to sell. Upon the residuals so much of the Company's prosperity depended. When he mentioned that in the half year, the residuals gave them £50,772, and that the dividend only took £34,000, they would see what a significant figure the former one was.

THE CONSUMERS AND HEATING APPLIANCES.

An element of great satisfaction was that in the half year they had greatly increased the very large number of stoves and other appliances which were in current use among the consumers of gas. It would be seen that over 69,000 private and slot consumers were upon their books; and of these some 50,000 were hiring appliances for the use of gas—not for its lighting, but for its heating, property. The Company were proud of the possession of 45,000 slot-meter users. It was a great fact that these prepayment consumers had got into the habit of using gas more freely in proportion to the ordinary consumers; and more especially did they do this in the summer months when it was valuable to the Company, seeing that it maintained in use plant that would otherwise be idle.

CO-PARTNERSHIP AND NATIONAL INSURANCE COMPARED.

There was a small figure in the revenue account for national insurance, amounting to £483. Immediately above this item would be seen one of the most important figures in the whole statement as reacting upon the profits. The profit-sharing distribution amounted to about seven times as much as the national insurance item. It was £2833, against the £483 contributed by force of the National Insurance Act. The profit-sharing system, the proprietors would realize profoundly, was a matter of value, because it enabled their independent, industrious, and thrifty servants to add in the bulk to their income, to store it up, and to invest it in the Company's stock for the rainy days of their old age. The £2833 weighed heavily against the National Insurance contribution of £483. The Government who held the money collected under the National Insurance Act must invest it thriftily and well if they wished to make much of it for the benefit of the working man in comparison with this £2833, which the Company held, to put into the stock of the undertaking in the names of the men. They had at the present moment a sum of £7097 in hand; and he might tell the proprietors that 564 of the employees possessed in the aggregate £6440 of stock. These figures would become greater as they went on. The larger the sum became, the greater would be its influence in showing independent-minded and industrious working men, of whom he was proud to say they had so many in their Company, what they could do for themselves; and what they could do for themselves in this way was more than they could do by enforced contributions to national health and unemployment schemes. There was no comparison between them. The Company had found it worth while to give the men this money because they earned it. Who, then, made the best provision for the working man—the employer, working under a co-partnership scheme, who benefited by the skilful co-operation of his men, or the Government with their national insurance scheme? He had been connected now with working men for forty-five years; and there never was a time when working men were better able than now (under normal conditions) to provide for old age, if they gave their hearts to their work, instead of giving themselves up to thinking that the gifts of life fell from the clouds or from the hands of political agitators.

VALUE OF COKE AS A STEAM-RAISING AND HEATING AGENT.

Reverting to coke, he felt very warmly upon its great value as a fuel. To the credit of their Engineer (Mr. H. O. Carr), he should say that, arising out of conversations with himself (the Chairman), the Company were the first to employ coke on an ocean-going steamer, instead of coal. They were also the first to replace coal by coke for road locomotives. The Engineer had endeavoured to get some of the smaller craft up the river to follow the Company's example; they had, in fact, in every way done their best to popularize the use of coke. Coke was a very special thing in itself. It was not produced as an ordinary manufacturer produced his commodities. It was forced upon them by the manufacture of gas; and the output could not be regulated to any extent. It had to proceed with equal steps with the production of gas. If it was not sold, it wasted, and ultimately lowered the market. It was a significant fact that whereas some 90 per cent. of the householders now cooked by gas (the working class forming a large proportion of this percentage), they formerly cooked by coal or coke; so that in prosecuting the adoption of gas-cookers, gas companies had deprived themselves of old coke consumers, and at the same time, through supplying them with the convenience of gas, had contributed to the production of more coke. In the drawing-room or the sitting-room, it was a fact that they got from coke the brightest, warmest, and most enduring combustion of any solid fuel; and the efficiency was greater than that of coal by about 40 per cent.

BANK LOANS OR NEW CAPITAL.

The proprietors would see that the Company owed their bankers a good deal of money. They saw how the bank rate went up on the declaration of war—wisely and providentially—to prevent the gold resources of the country going down. The proprietors knew that it was not possible to get these loans at the same rate of interest that they formerly paid. They at one time got loans at less interest than the dividends paid on the capital. The bank lent them money in normal times at (say) 3½ per cent. interest, instead of the 6 or 6½ per cent. dividend paid to the proprietors. But now they had to reconsider the position. Last year they raised some capital on rather poor terms, because he thought the general investor failed to realize what a very prime investment was the stock of the Company. If they reflected upon the fact that the Company supplied the larger part of their gas at 1s. 8d. (nominally it was 1s. 9d.), this ought to show what a good investment the Company's stock must be; seeing that, from such a low price, such an excellent dividend was secured. The moral of his song was that they must pay off the bankers, and so must sell more capital; and this would be by auction. He hoped the proprietors would rally round the Directors in this matter, husband their dividends, and reinvest them in this prosperous undertaking. In this way, they would escape the high rate of interest to the bank; and the proprietors would receive a high rate of dividend from the extra profits which he felt confident of making in the future.

The DEPUTY-CHAIRMAN (Mr. R. Garraway Rice) seconded the motion.

Mr. GEORGE ENNIS congratulated the Chairman and the Directors on the report and accounts. When the time came for the creating of stock to the extent of the Company's loan to the bank, £78,000, he hoped that the Directors would set aside some trifling amount to a fund so that the proprietors who held fractions of stock might from it, at the market price of the day, round-off their holdings. The Secretary told him that he had not such a fund; and he (Mr. Ennis) found the greatest difficulty in getting from the Stock Exchange small amounts for the purpose he had mentioned. He therefore hoped the Directors would take this opportunity of doing something to meet the proprietors in this matter, without doing anything disadvantageous or outside their statutory powers. He also congratulated the Chairman and Directors upon their immediate action in respect of the servants of the Company who had been called out or had volunteered for service. What had been done would no doubt be a great relief to the men, and save them much discomfort and misery. There was the point as to the contribution from the reserve fund to one of the relief funds. He was disposed to think that this was a matter that could well be left in the hands of the Directors. The Directors knew the necessities of their officers and servants; they knew, too, the necessities of outsiders who would require assistance in these times. Although there might be a little irregularity in dealing with the funds of the Company, still lawyers had a saying that "subsequent ratification was as good as antecedent authority."

Mr. L. ANDREWS remarked that it would relieve the minds of the proprietors to know that the stock of coal and oil were quite up to the standard for this time of the year.

Alderman PORTER asked from which portion of the Company's area the increased gas business had come. He was glad to learn that the Directors were proposing to render assistance in the matter of the relief funds. He knew something of the distress that was already showing itself; and he too felt it was the duty of all to do a part in alleviating it.

The CHAIRMAN said it was evident the Directors would be well backed up in any action they might take in the matter of contributing to the relief fund. But they had to keep within the four corners of certain legislative restrictions. They had extremely vigilant Auditors, who would be after the Board if they did anything irregular; so that the Directors might have to call the proprietors together to authorize or condone anything they did in this regard. So far as the coal stock was concerned, the Company were in better position than ever, despite the fact that their steamer was hung-up for some time owing to the wretched engineers' strike; and then at the outbreak of war, they were warned not to run until things were rendered safe. The Company had gas-making materials which would carry them on for nine or ten weeks; and he had no doubt this stock would be maintained for some little time, because as long as the Navy could keep command of the sea, the Company's ships could sail. Having the advantage of possessing their own ships, they were able to run them; whereas some shipowners, attracted perhaps by the heavy rates that were given in other quarters (others, of course, had to act under compulsion), had thrown over some gas companies' contracts. There was no doubt their own Company were now being better served than if they hired ships. With regard to the increase in the sale of gas, they suffered a loss of something like £1200 in receipts owing to the reduction made in March. With regard to the question as to the area from which the increased consumption had been derived, something like 52 per cent. of their income came from the Wandsworth area, 42 per cent. from Mitcham, and the balance from the Epsom area. The reductions in price were 1d. per 1000 cubic feet in the Mitcham and Wimbledon area, and 1½d. in the Epsom area. As to the location of the increase, it was inevitably larger where the reductions in price had been made than in the older part of the Company's area. The largest increase had been in the Mitcham area, where there had been a great deal of expenditure on meters and other things. But this expenditure had been most fruitful in increasing the sale of gas there. In the Mitcham district since the amalgamation, the price of gas had been reduced by 4d. per 1000 cubic feet; and this ought to make the consumers contented there.

The motion was unanimously carried.

Moved by the CHAIRMAN, and seconded by the DEPUTY-CHAIRMAN, dividends were declared at the following rates per annum: On the Wandsworth "A" stock, £8 7s. 6d.; on the Wandsworth "B" stock, £6 17s. 6d.; on the Wandsworth "C" stock, £5 17s. 3d.; on the Wimbledon stock, £6 2s. 6d.; on the Epsom stock, £6 12s. 6d.; and on the new ordinary stock, £5 17s. 3d. per cent.

The CHAIRMAN proposed a hearty vote of thanks to the staff and the employees for their strenuous services during these times. Their Secretary (Mr. Braine) had been hard at work day by day ever since the amalgamation came about in squaring up the books, and in assimilating all the details. He had been deprived of the chief assistant accountant (who was formerly the accountant of the Mitcham Company) who had gone to the war. Their Engineer (Mr. H. O. Carr) was always up to his eyes in anything that would further the interests of the Company. There were other members of the staff who were efficient, praiseworthy, and industrious fellows; and their men were also working with the greatest zeal and intelligence.

The DEPUTY-CHAIRMAN seconded the motion, which was heartily agreed to.

Mr. BRAINE, on behalf of the clerical staff, thanked the Chairman for his kind remarks, and the proprietors for their endorsement. They would now all have to pull themselves together a bit to "make good" for those who had gone to the war. They would all use every possible endeavour to see that the interests of the Company were not injured; and, at the end of the war, they hoped to have the pleasure of offering a hearty welcome home to all their fellow workers who had gone out.

Mr. CARR, in his acknowledgment, said he could pledge his staff, men, and himself to use their very best endeavours under the present pressure to forward the interests of the Company.

Proposed by Mr. ANDREWS, and seconded by Mr. SAMSON, a cordial vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN, in his acknowledgment, dwelt upon the importance to communities in times of war of having in their midst stocks of solid and liquid fuel such as were to be found at every gas-works.

LEA BRIDGE DISTRICT GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held last Tuesday, at the Offices, No. 147, Dashwood House, New Broad Street, E.C.—Mr. A. M. PADDON, M.Inst.C.E., in the chair.

The SECRETARY (Mr. Richard Sandell) read the notice convening the meeting; and the report—*ante*, p. 404—and statement of accounts were taken as read.

The CHAIRMAN said, coming directly to the report and accounts, as constituting the primary purpose of the meeting, he was certain the shareholders would agree—particularly those of them who were familiar with such matters—that, taken by themselves, there was very little in the statement now before the proprietors that was amenable to criticism.

AN INCREASED CONSUMPTION AND THE PRICE OF GAS.

It would be seen from the second paragraph of the report that during the half year to June the increase in the business of the Company had been quite as large as the Board were disposed to consider favourable—the gain in the consumption, as compared with the corresponding period of the previous year, amounting to 8½ per cent. And it would be noticed from the next paragraph, as consistent with this advance and the generally favourable nature of the figures in connection with it, that the Directors had reduced the price of gas, as from July 1 last; the charge being now 2s. 11d. per 1000 cubic feet. This was not so low, intrinsically speaking, as the charges of some of their neighbours; but taken in connection with the dimensions and character of their business, it was as low as the past had afforded any record of. When they heard of companies selling at extraordinarily low prices, they were apt to think this had been a characteristic along the whole line of their history. But if they would go back, they would find that the price had always been relative to the quantity of gas sold; and that very few companies selling just over 400 million cubic feet of gas had been in a position to charge less than 3s. per 1000 cubic feet, as their own Company were doing to-day.

PROPORTION OF CAPITAL TO BUSINESS.

Leaving the report for a moment, and turning to the accounts, the proprietors would notice the important fact that the Company had something like £50,000 of capital yet to issue. The capital account showed that there had been an expenditure of some £8434 during the six months under review. This it was absolutely impossible to avoid in connection with such an extension of the business as he had already alluded to; but it would also be noted that £4765 had been written-off from the revenue account for depreciation, reducing the addition to the capital account to £3000 odd, which was a very small committal indeed in connection with the increase in the Company's business. Of course, as he had always said, and would always repeat, this was the criterion of gas administration—whether one could extend the business at a greater rate than one was compelled to call up capital to meet the extension. In the revenue account, the various items of which were always of current interest, coal had, of course, cost more, but they had had an important increase in business, and a very substantial improvement in results, to set against the increase in the cost of materials.

CHARGE FOR REPAIRS, MAINTENANCE, AND RENEWALS.

There was not much more to comment upon in the revenue account until they arrived at the item of repairs and maintenance of works and plant. This figured at just over £4000, and taken in connection with the sale of gas for this period it amounted to slightly more than 4d. per 1000 cubic feet. He would ask them to consider this item in connection with the following ones—repairs, maintenance, and renewal of mains, service-pipes, &c., and repairing, renewing, and re-fixing meters, stoves, and fittings. The charge in connection with mains and services was £2867, which was nearly 3d. per 1000 cubic feet of gas sold. In respect of meters there had been spent £1762, equal to 1·8d. per 1000 cubic feet; and for stoves and fittings, the figure (£5563) worked out at 5·71d. Aggregating these amounts, which were all in the direction of maintenance and improvement, the total expenditure per 1000 cubic feet of gas sold came to 14·6d. The significance of this figure was that, whatever they showed in the way of profit, and whatever they might claim on behalf of the accounts, must be considered with such a charge as this as a condition precedent. He had often, in the Parliamentary Committee Rooms, heard experts give evidence, of which they ought to have been perfectly ashamed, that something like 8d. per 1000 cubic feet was ample for all these purposes. The proprietors knew how expert witnesses had been characterized; and he was sorry to say, from his experience of them, that they deserved most of the hard things said. He did not believe that any gas company could be carried on satisfactorily from year to year that did not allow well over 10d. per 1000 cubic feet for these charges—that was, keeping everything sweet, clean, efficient, and up-to-date, and a little beyond it, as should be done with all these things. With the amount allocated by their own Company, they were in a very strong position indeed in regard to any balance of profit they might show. Of course, in making a charge of this kind, the first effect was to save capital investment, and to save capital investment was to save interest. The interests of all concerned—shareholders, consumers, and everyone involved—were best consulted by keeping the revenue charges at a properly high point. In looking over the records of other people—which was a nice thing to do—he had always managed to hit upon the bad engineers and managers—by turning up the items he had been referring to, and seeing what they had dared to show. There was not much more to comment upon on this side of the account; but it would be seen that the profit was slightly larger.

RESIDUALS AND CARBONIZING RESULTS.

Turning to the credit side of the revenue account, there were some figures calling for passing notice. The sales of gas amounted to something like 233 million cubic feet, showing the increase he had spoken of. This, of course, brought with it its increment of rental. As far as residual products were concerned, coke had brought in more than was the case twelve months ago—£3009, against £2665—and tar had also realized slightly more. The only falling off was in connection with sulphate of ammonia, and the residual from which it was derived. This was absolutely unavoidable, because, as all of them knew, there had been great depreciation in the market; and as their figures for the proportion of sulphate of ammonia were already as good as they could be, there was no margin for improvement by securing a larger quantity per ton. Regarding coke, however, a very considerable improvement had been made in the efficiency of their furnace working; and this was reflected to a great extent in the accounts. The quantity of gas sold per ton of coal carbonized was 12,297 cubic feet, which was a good figure. There were many better extant, in connection with this half year; but it must be remembered that these figures were nearly always in regard to the later forms of carbonizing plant, which had produced economies during the last four or five years. The figure he had just quoted, however, was secured from carbonizing plant put down in 1899; and it had had no such advantage as he had referred to in improvement of design. They were now transforming their plant, which had done its work. It had been necessary to enlarge it; and they were adopting the most recent form of carbonizing, in so far as it had been justified by the results attaching to their investigations. They might therefore look forward to some improvement in the amount of gas made and sold per ton; and they felt tolerably sure they would obtain considerable advantage in the production of coke. In a year from now, they might reasonably hope to find this economy reflected in the accounts then presented to the proprietors. The profit and loss account showed what they did with their profit as it was earned; but the report put this very succinctly. They proposed to declare a dividend at the rate of 5 per cent. per annum on the preference stock, and at the rate of 6½ per cent. per annum on the consolidated ordinary stock, and to carry £732 to the reserve fund; and having done this, they were able to carry forward a slightly increased amount to the next half year by way of undivided profits.

UNDIVIDED PROFIT LIMITATION AND CALORIFIC STANDARD.

Some of the proprietors were aware that the Company were under a rather vexatious limitation in the matter of undivided profits, because Parliament, in its unwisdom, in 1899, decided that they should only carry forward £6000 by way of undivided profits. Parliamentary practice had been very much reformed since that time; and it was now the general law to allow companies to carry forward one year's dividend, which was over double the amount to which their own Company were limited. The Lea Bridge Company would be very glad to have this alteration; but they were not going to Parliament to get it, because they might get a good deal more which they did not want. At the present time Parliament was a place to be more than ever studiously shunned. The course of legislation in gas affairs during the past session had been absolutely disastrous. He had never known a session in which there had been so much legislation passed detrimental and derogatory to the gas industry; and if the Company could only hold out until the precedents set had been weakened, they would be lucky. The calorific standard had been most unfortunate. Instead of lightening the burdens of gas companies, it had materially added to them, and he was personally very doubtful whether the new calorific regulations could be met without a definite amount of added loss. It was a fatal campaign, which never ought to have been started or persisted in. It must be obvious that the very last word in favour of gas companies who were under testing regulations was achieved when Carpenter's No. 2 burner, with a 14-candle standard, was given. To give up this ground was to lose; and those who had abandoned it had lost heavily. The Lea Bridge Company had a 15½-candle standard; and this was a fact which must always be borne in mind in connection with the accounts. They could not help it; they were caught in the vortex of legislation. But they had fortunately the No. 2 burner; and the proprietors might take it from him that the Directors would not attempt to disturb these conditions of supply unless they were obliged to.

THE RESERVE FUND.

Coming back to the accounts for a moment, it would be seen that the reserve fund stood at £19,648. This was invested in securities; and from the first moment of his connection with gas administration, he had always protested most strongly against the practice of allowing the reserve fund to be invested in the business. It was a very favourite practice in the old days. But in the first place it was illegal, and in the second place he thought it very bad policy. In times like these, he was certainly thankful it had not been attempted in connection with the companies he was responsibly concerned with. The money in the reserve and insurance funds had been disposed of as prudently and as safely as trustees could dispose of it; and this must be an added element of strength to any company in times like these.

THE COMPANY AND THE WAR.

Of course, at the present moment they were all concerned with the broader view of things. The details he had given would form the basis of self-congratulation, and would be very congenial matters to deal with, if they were not overshadowed by the canopy of war. Everything became subordinate to that. Now, he would not pretend

to say for one moment how the war would affect such interests as theirs. The man who affected to be a prophet at this juncture was, he thought, foolish into the bargain. They did not know, and could not tell. But adversity in the case of joint-stock undertakings had much the same effect as in the case of individuals. It tested their character and condition. It was bound to show them, in the affairs of the Company, where they had been weak, if they had been weak, and where they had been strong, if they had been strong. In this way, it would help them. It was not an unmixed evil; and there was nothing at the present moment which it was his duty to call their attention to as constituting anything abnormal in the general atmosphere of uncertainty, doubt, and difficulty. Matters had been dealt with as they arose. They were in the same condition as other companies, of having lost a number of their employees, who had gone to serve their country; and they had determined, in common with other concerns, to do everything they possibly could to assist them and their families ["Hear, hear"], and to compensate them for their devotion and self-sacrifice. The Directors proposed to pay to the wives left behind one-half the wages of their husbands, up to 15s. per week; and for every child under fifteen, and wholly dependent upon the parents, 1s. 6d. per week. The cases in which single men had parents or elderly relatives dependent upon them would be considered on their merits and dealt with as occasion arose. With regard to single men who had gone, they did not propose at this time to give them any money or make them any allowance, because the men could not benefit from it if they did. What it was intended to do was to keep their employment open for them; and on their return, should the Directors have to deal with it, they proposed to give them a bonus or a payment which would put them in a position to resume their ordinary vocation in life without disadvantage or disability—or something a little better. The Board had also determined to contribute 300 guineas to the Prince of Wales's Fund. This, again, was normal. All undertakings were doing it, and the sum named the Directors considered was consistent with the Company's importance and ability to contribute. He was sure the proprietors would support this. ["Hear, hear."] Nobody would stop to consider whether it came within the strict legal powers of the Company, though he was confident that it did. Under the general enabling powers of the incorporating Acts, the Board would be perfectly justified in taking this action in the interests of the Company; but there was no need to look at it from this point of view. He concluded by moving the adoption of the report and accounts.

Mr. G. W. CAREY seconded the resolution, which was at once carried unanimously.

On the proposition of the CHAIRMAN, seconded by Mr. A. F. PHILLIPS, the payment of the dividend recommended, and the allocation to the reserve fund, were agreed to.

The CHAIRMAN then moved a vote of thanks to the officials—remarking, at the same time, that it would be looked upon not so much as a vote of thanks for what they had so excellently done, but rather as a vote of confidence in relation to what was before them. They would have very great difficulties to contend against. The banks had behaved magnificently, and indeed the whole financial situation throughout the country had been handled with a great deal of tact and skill; but, of course, the Secretary of a Company like theirs had much to do in these times. A week ago things were not so settled as they were now; and officers had worked almost continuously, as well as boards. Mr. Sandell was the medium of communication between the Company and the banks; and his record was a high one. For some time to come the necessity would remain of meeting new emergencies both promptly and effectively.

Mr. JOSEPH CASH, seconding, remarked that he had a great deal of sympathy with the Engineer (Mr. F. W. Cross) in what was facing him. But if he had the hearty co-operation of those under him, as he (the speaker) had in his own Company, it would lighten the difficulty. He had found the spirit of loyalty among those under him was such that it made three men do four men's work. He was sure the encouragement given to the territorials and reservists would have a very great influence in easing Mr. Cross's task.

The vote having been cordially passed,

Mr. SANDELL, returning thanks, said he had watched the Company grow from a very small baby to a very big boy; and it had afforded him great gratification to see the splendid results of the past half-year's working. He pointed out that the offices of the Company would be very shortly removed to some more central and suitable position in Chancery Lane.

Mr. CROSS remarked that, while the Chairman was speaking on the accounts, his own mind went back to a year ago, when reference was made to the troublous times in front of them, and it was predicted that they would be reflected even in the accounts for the June half of this year. Certainly, he had hoped that they had got through their troublous times; but now they were into them again more thickly than ever. However, they would all do their best. Mr. Cash had spoken about the loyalty of the men. He (the speaker) had a list of ninety men who had volunteered for the protection of the Company's property, without any thought of reward. This was a very good feature. Further, there was another point which was interesting, in connection with three men trying to do four men's work. They had lost a fair number of men from their works. Naturally, this upset things somewhat; but when he spoke to foremen and inspectors, and asked them if they wanted any more men, they answered "No." The spirit with them was that they would do without extra men—that they would get the work out of the men they had, and keep the places open for those who had gone away. With this spirit among the men, the work would be carried out very well.

The proceedings concluded with a hearty vote of thanks to the Chairman and Directors, which was accorded on the proposition of Mr. A. W. OKE, seconded by Mr. F. J. BANCROFT.

Mr. C. S. Wheeldon, an assistant in the show-rooms of the Brentwood Gas Company, who recently joined the Liverpool Police Force, was last Friday week presented by the Secretary (Mr. A. E. Johnson) with a case of razors, on behalf of the officials and outdoor staff.

CROYDON GAS COMPANY.

The Half-Yearly Meeting of the Company was held last Friday, at the Offices, Katharine Street, Croydon—Mr. CHARLES HUSSEY, J.P., in the chair.

The SECRETARY (Mr. W. W. Topley) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

THE WAR, THE MEN, AND COAL STOCKS.

The CHAIRMAN, in moving the adoption of the report and accounts, which showed a balance of £42,570 available for dividends, said: I am sure that all present are conscious with me of a feeling of difficulty in turning our minds to the routine matters of Company business in face of the terrible calamity that, with so little forewarning, has fallen on the peoples of Europe. What may be the immediate effects of the war, it is difficult to foresee; one cannot even conjecture its ultimate results. We may congratulate ourselves, however, that, so far, our nation in matters military, financial, and social, is facing circumstances with quiet resolution and freedom from panic. Naturally an undertaking such as ours is has been called upon to furnish its quota of soldiers and sailors from the Territorials and others in our service. In all so far 75, or rather more than 10 per cent., of our employees have been called up to active service for their country. Your Directors have, ever since the establishment of the territorial force, done what they could to encourage the Company's men to join it by granting full pay time for camp training, and by providing a rifle range for practice. They feel assured that the proprietors will approve the steps they are now taking on behalf of men who have gone on service under the obligations already incurred by them. In regard to all of them, it is intended that, as far as practicable, their positions shall be open to them on their return; and, in regard to married men having wives or children, the Company are making up the Government pay and allowances to the full amount of each man's wage. In the cases of those men who are unmarried, but who have others dependent on them, each case will be considered by the Directors. So far as we can foresee, the Company are in a position to carry on their business and discharge their duties to the public in quite the normal way. Temporarily, at all events, supplies of coal are stopped. But shipments may be resumed at any moment; and even did we not receive another truck load, we could maintain the supply of gas undiminished until at least the end of October. Measures have been taken, in conjunction with the military and the police, for guarding our gas-works, and over 25 of the Company's employees have this week been sworn in as special constables exclusively for this duty.

OFFICE AND SHOW-ROOM EXTENSIONS.

We meet for the first time in our new lecture hall; and I hope you will agree with me that in this, and indeed in our offices and show-room generally, we now have premises in which the proprietors can take a justifiable pride. They have been costly; but the added accommodation was urgently needed. The clerical and other work centred here can now be performed more efficiently; and we are able to display apparatus in a way which will, I believe, help much in the growth of our business. I hope all present, if they have not done so, will take a stroll through the new parts and the alterations made before they leave. It must not be forgotten that the uses of gas are extending so rapidly that few people have any idea of the varied purposes for which it can and should be used. The British Commercial Gas Association, among their other activities, publish from time to time a pamphlet, which they call "A Thousand and One Uses for Gas," describing the various trades and purposes in and for which gas is used; and the title bids fair to be justified by the publication.

GAS SALES—THE TIME FOR FIXING FIRES AND COOKERS.

Our sales of gas, as you will have noticed, show the satisfactory—I think, indeed, I may say the very gratifying—increase of 7·56 per cent., representing 57 million cubic feet for the half year alone, or in money £7031. With this goes an increase in the number of consumers, of gas-stoves, and of other apparatus. Particularly satisfactory is the increase in the number of gas-fires on hire. This is far greater than we have ever before experienced in a June half year. It is natural enough that, as the summer approaches, our business in gas-fires gives way to that in cookers, and that in the autumn and winter months the reverse is experienced. This is partly due to the quite reasonable disinclination of new residents who move in the spring or summer to then instal gas-fires, while those who move in the autumn, or early winter, are disposed to let the installation of a gas-cooker stand over till the following year. Sometimes this has the result that, when the natural time (as they think it) for hiring a fire or a cooker comes, they overlook the matter, or are unwilling to have their houses disturbed by workmen; and so the opportunity is, for the time being, lost to the Company. Again in the cases where the consumer does order the cooker or gas-fire in the spring or the early winter, he waits till he wants it urgently; and as this is just when a number of other consumers are also wanting stoves urgently, there is a great temporary pressure of work on our stove and fitting department, and occasionally some delay is inevitable, though this, I am glad to say, we minimize so far as we possibly can. If consumers can be got to spread their hiring orders for cookers and fires more evenly through the year, they will benefit by prompter attention; we by more regular work. We have realized that, while we gain in this matter, consumers who order fires in early summer would be paying rent for apparatus that, for all their needs, might as well be installed in October, and to a certain extent the same applies to cookers ordered in the autumn. So we have arranged that gas-fires ordered after March 1 shall not become subject to rent till October, and that cookers ordered after Aug. 1 shall be rent free till the following March 31. Thereafter, of course, the annual rentals will be payable in the usual way, by equal quarterly instalments. This arrangement was only brought into force in March last, so we do not yet know to what extent it will affect our autumn output of cookers; but judging from our three months' experience in the case of fires, we have strong hopes that it will also be successful with the cookers. Under the heading of capital account, you will see that somewhat

large sums have been expended on new buildings and manufacturing plant. We shall have yet to spend a good deal of money on our works to meet the growing requirements of the district. Foremost among the expenditure now being incurred is that upon the new gasholder. Great progress—though not quite so much as we had hoped—has been made by the contractors for the tank; and a contract has been entered into for the construction of the holder itself. Our hope has been to have it ready for use by the winter of 1915-16; and if this be realized, it will not be ready before it is badly needed. The next matter on the works to occupy attention will be the modernization of No. 1 retort-house, which has stood empty since hand stoking there was discarded some years ago. Our Engineer is inquiring into carbonizing methods, and a decision as to the best method to be adopted there will shortly be come to.

FURTHER CAPITAL.

From what I have said, and from the accounts themselves, it will be clear to you that further capital must be raised at an early date—in fact, as soon as the market conditions will enable this to be done on reasonable terms. The issues made during the half year practically exhaust so much of the Company's powers to raise capital as the Directors can exercise without a further sanction from the proprietors; and you will accordingly be asked at this meeting to pass the necessary resolution authorizing the issue of further capital to an amount sufficient to produce £100,000. It is not, however, intended that this shall be raised earlier than is absolutely necessary, and, of course, the stocks will not all be issued at once.

FINANCIAL RESULTS AND CHEAPER COAL AND OIL.

In regard to the revenue account for the half year, the figures you have had, showing as they do a comparison with a year ago, may, I think, be left to speak for themselves. You will see the balance of gross profit is £10,000 less than this time last year; the explanation will be at once apparent on reference to the headings "Coal, oil, &c." on the debit side, and "Residuals" on the credit side. We have paid much higher prices for coal; while the values of coke and sulphate of ammonia have been at lower levels. In fact, the loss of revenue due to these three items works out to over £9400 for the half year, while the increase in expenditure on public lighting is £800, which suffices to explain the difference. By agreement with the Corporation, we have been engaged on converting the street-lamps in Croydon to inverted lighting, giving the town a better light at a lower cost. The consequent alterations to the street-lamps has made it necessary to renew a considerable number of lanterns earlier than we should otherwise have done; so that this expenditure is really an anticipation of what we should have spent later on. We are proposing to pay dividends at the usual rates; and, after doing this, there will remain nearly £19,000 as balance of profit to carry forward—not so much as was brought into the half year, but still a very respectable reserve in itself. In the half year we have now entered upon, we shall have cheaper coal and cheaper oil than a year ago—that is to say, we have made contracts at lower prices—and, but for any disturbances to our trading that the war may produce, I could I think have prophesied that our dividends would in December have been fully met out of the half-year's earnings. I hope that this may yet be the case.

The DEPUTY-CHAIRMAN (Mr. Thomas Rigby), in seconding the motion, said there was one item to which he should like to draw attention, and that was the charge for maintenance. It would be seen that they had in the half year spent some £3000 more upon the maintenance of works, mains, meters, stoves, &c. This, he was sure, was a policy that would commend itself to the proprietors, as it showed that the accounts were really very satisfactory.

LOCAL ISSUE OF STOCK.

Mr. CHARLES WEBB said he had to thank the Directors for coming to the decision to have the Chairman's speech reported and circulated among the proprietors. This would be appreciated by many of the proprietors who were not present. He believed the Company had over 2000 stockholders, and many of them he was sure never saw what went on at the half-yearly meetings. In his opinion, every proprietor ought to know what transpired. The second point was that he would ask the Directors to consider the advisability of putting new issues of stock up to local auction, so as to let the local people have a look in, and not at the Mart, where a few people went and monopolized the whole amount, and then the small investor came in, and took it off their hands, but had to pay some 5, 6, 7, or 10 per cent. more for it. This was not treating the small investor in a proper way. In addition to putting the stock up locally, he should suggest that a local man who was in touch with the residents should be employed for the purpose. He believed it was the case at the last sale that the stock was placed in the hands of two or three people, and the proprietors who came in afterwards had to pay 5, 6, or 7 per cent. higher than the price paid at the sale for what they wanted. He did not think this was fair.

Mr. A. W. OKE thought the case would be met by the Secretary offering from time to time to purchase small lots of stock on behalf of small investors. Some of the lots could at the sale be divided into lower amounts. It must be remembered that there were a large number of proprietors who were not local ones, and that the Company was a large one; and so possibly a better market was obtained in a central place like the City. Moreover, it was very convenient for resident proprietors or other local investors to get backwards and forwards to the City. Might he, while speaking, congratulate the Directors on the excellent report they had placed before the proprietors, who knew how great were the difficulties there had been in regard to coal and oil. The splendid new lecture room in which they were meeting alone went to show that the Company were second to none in progressiveness in the South of England.

The CHAIRMAN said, in regard to Mr. Webb's remarks, it was with great pleasure the Directors had decided to have a report of the meeting circulated among the proprietors. But it was not altogether correct to say that all the proprietors who did not come to the meeting did not see a report of the proceedings. A report appeared in the gas journals and in the local papers. As to new issues of stock, two out of the three issues during the past half year had been by tender, so that every proprietor, small or large, had had an opportunity of tendering. Mr. Topley had always been pleased to do what he could to help proprietors who wished to buy stock; and they had a local man who dealt largely in the stock, if any was required, and at a reasonable price.

The motion was unanimously carried.

THE PRINCE OF WALES'S RELIEF FUND.

Mr. F. G. SAMSON said he rose with great pleasure to propose that a sum of money should be sent to the Prince of Wales's Relief Fund. He believed he was right in saying that the Directors could not do this without the sanction of the proprietors. He knew that he would not have to appeal for support when he proposed that £250 be sent to the relief fund.

Dr. BARKWELL seconded the proposition.

Dr. CRITCHLEY, in support, said he had no doubt that most of those present had individually given to the fund to the amount they felt they could do. Although this was so, a contribution of £250 from the funds of the Company would not be felt individually, and yet at the same time it would go a long way towards alleviating the distress to which they must look forward. No other country could respond as this one had done to the call that had been made for funds to meet the inevitable distress. It had been hinted in a very influential quarter that Belgium, which had suffered terrible devastation, and yet was not able to do for its people what this country was able to do, might receive part of the funds that had been collected in this country; and if this should become necessary, he could only say that personally he should be very pleased indeed, in order that their Belgian friends might share in it, to double the contribution that he had already made to the fund.

The motion was heartily adopted.

The CHAIRMAN remarked that it was a great pleasure to the Directors to know that this resolution had been so heartily proposed and received by the proprietors. The Board felt that it would not be right if the Company did not contribute something. In Croydon alone over £10,000 had been raised for the fund. Croydon would get its quota back as required; and it would also be helping other large towns and districts which were not perhaps so well placed as Croydon in regard to the number of their poor.

Mr. WILLIAM PEET suggested that the contribution should be made through the Mayor's fund.

The CHAIRMAN said there was no reason why it should not be.

THE DIVIDENDS.

Sir CORBET WOODALL, D.Sc., proposed that dividends for the half year be declared at the following rates per annum, less income-tax: 15 per cent. on the £51,600 "A" stock, 12 per cent. on the £178,400 "B" stock, 12 per cent. on the £100,000 "C" stock, 5 per cent. on the £71,000 "D" stock, and 10 per cent. on the £25,000 "E" stock, as well as 5 per cent. on £3155 "D" stock for the three months ending June 30. He observed that, if the Company could afford as they could to make a contribution with the heartiness and unanimity just witnessed to the relief of distress, to care also for the families of their men at the front, and if they could provide every penny that was wanted to maintain their undertaking in the highest state of efficiency, they as stockholders had also the right to expect they should be paid their dividend. As probably most of the proprietors knew, there were grave doubts a few weeks ago whether they would be able to pay the dividend forthwith. But when they found from the accounts that they had enough money in reserve to pay the dividend for at least three half years, he did not think they were going beyond the bounds of prudence in declaring the usual dividends, and in paying them. In regard to the future, no man to-day would venture to prophesy. All they could say was that the Directors believed they were in as good a position as their neighbours to maintain the dividends in time to come; and he was quite sure they were justified in saying that all that could be done by capable officers and by men willing and loyal would be done to uphold the Company in the position they now occupied.

Mr. PERCY H. HALL seconded the motion, which was adopted.

NEW STOCK AUTHORIZATION.

The CHAIRMAN proposed—

> That the Directors be, and they are hereby, authorized, pursuant to section 4 of the Croydon Gas Act, 1904, from time to time to raise, by the creation and issue of "D" stock, additional capital, amounting in the whole to the sum of £75,000, inclusive of premiums to be obtained on the sale of the said stock.
>
> That the Directors be, and are hereby, authorized, pursuant to section 14 of the Croydon Gas Act, 1904, from time to time to borrow on mortgage of the Company's undertaking, or by the issue of debenture stock (in addition to any moneys already borrowed or authorized to be borrowed, but inclusive of any premium to be received on the creation and issue of mortgage debentures or debenture stock in exercise of the borrowing powers hereby authorized), one-third part of the amount of the additional capital by the last preceding resolution authorized to be raised, and at the time actually issued by stock.

He said he hoped that, in mentioning the sum he did in his speech, the proprietors would not be led to believe that the Directors intended to raise all this money at once. All they would do would be to raise the money as required for works and apparatus that were actually necessary. They were now really behind in works to compete with the growing consumption of gas and other matters in connection with the undertaking.

Mr. SAMUEL SPENCER, in seconding the motion, said the money would be spent with due care and consideration for the proprietors and to the ultimate benefit of the Company.

Mr. A. W. OKE said he was pleased to see the Board had decided to ask the proprietors to give them the power to issue mortgage bonds. During the last few years, it had been the practice of gas companies to largely depend upon debenture stock. But in former times, when gas companies were less prosperous, they relied very largely upon mortgage debenture bonds. It had been the practice lately for bankers in the South of England to offer only 2½ per cent. for money placed with them on deposit. In regard to money so deposited, people were under the impression that they could get it again at any time, or, at

any rate, on giving seven days' notice. There had, however, been a very rude awakening lately. If the money had been placed with the Croydon Gas Company at 4 per cent., and six months' notice, there would have been the opportunity of having the money repaid if wanted, besides pocketing 1½ per cent. more. Therefore he was pleased to see the Directors proposed to take the power to borrow on mortgage, which would be convenient to investors who did not want to become permanent holders of gas stock.

The motion was unanimously carried.

Votes of Thanks.

Moved by Mr. Samson, and seconded by Mr. William Edgar, a hearty vote of thanks was passed to the Chairman and Directors. Mr. Edgar remarked that he thought the Directors had done well, taking into consideration the factors that were against them, in being able to report an increase of 7·56 per cent. in the sales of gas.

The Chairman, in responding on behalf of the Directors and himself, said they had been passing through very anxious times, and he was afraid they had still more anxious times before them. He trusted the war would not last long; but they were in the fortunate position of having cheaper coal and oil. He had not the slightest doubt that, if times quickly became normal, they would be able to present to the proprietors equally good, if not better, accounts at the next meeting. He then moved a vote of thanks to the chief officers, their staffs, and the workmen, for their efficient services. As usual, he had nothing to say but in terms of the highest praise of their officers, beginning with Mr. Caddick, their Engineer and Works Manager, Mr. Topley, their Secretary and Accountant, and Mr. Sandeman, their Distributing Engineer and Sales Manager. All these gentlemen worked together harmoniously, and the result, as seen in the accounts, was excellent, considering all things. Mr. Reginald W. Helps, eldest son of their late Engineer and General Manager (Mr. James W. Helps) had been appointed assistant to Mr. Caddick. He ought also to specially mention the services of Mr. Anderson, the Assistant Secretary, Mr. Stone, the assistant to Mr. Sandeman, and Mr. Haines of the Rental Department. The men were likewise giving their best services, and throughout there was evidence of loyalty and a feeling of cheerfulness.

Mr. W. J. Russell seconded the motion, which was cordially carried.

Mr. Caddick, in replying for his staff, the men, and himself, said they had been passing through a strenuous period, and had perhaps a more arduous time in front of them. But they had a body of workmen and a staff who were prepared to face all difficulties, and, if possible, to overcome them. He hoped, however, that their worst fears would not be realized, and that the difficulties would be few.

Mr. Topley and Mr. Sandeman also acknowledged the vote on behalf of their respective staffs and men, and expressed appreciation of the confidence of the Board and of the proprietors, which was the best possible encouragement to them all.

BRIGHTON AND HOVE GENERAL GAS COMPANY.

The Half-Yearly Ordinary General Meeting of this Company was held on Friday, at the Offices, No. 5, Great Winchester Street, E.C.—Mr. A. M. Paddon, M.Inst.C.E., the Chairman, presiding.

The Secretary (Mr. E. L. Burton) read the notice convening the meeting; and the report [*ante*, p. 416] and statement of accounts were taken as read.

A Loss to the Company.

The Chairman said that before proceeding with the business for which the meeting had been called, he must refer to an incident which they all profoundly regretted had supervened since the report was prepared for circulation among the proprietors. They had lost their Deputy-Chairman, Mr. Robert Hesketh Jones. He need hardly tell them how much Mr. Jones was missed by the Board, and how completely they had always appreciated his experience and his very high personal character. Most of those present knew how diversified were his interests in the gas industry, how wide, and how very prolonged. If any consolation could be gained from the circumstances in which he had left them, it was in the fact that he had been spared very much of the intense anxiety and apprehension which all of those who remained behind would have to face to the full. The Directors had appointed Mr. Frank H. Jones to fill the vacancy on the Board thus occasioned. They did so without any loss of time, because in the existing circumstances the special experience and knowledge of Mr. Frank Jones were of the greatest possible service to the administration. The appointment had been made upon the one and sole compelling ground of merit. The Board felt that whoever they appointed should be qualified in the fullest degree, that he should be well versed in the duties which he was about to undertake, and that he should have proved himself efficient as a director of gas companies. Mr. Frank Jones not only complied with every one of these requirements, but he did so to such an extent as to make his election to the Board a matter upon which both Directors and proprietors could congratulate themselves.

An Increased Sale of Gas and a Lower Price.

Coming to the report itself, if they had to consider the matters referred to in any other atmosphere than that which now obtained, they would be satisfying in their entirety. There had been the quite satisfactory increase in their business of 26½ million cubic feet of gas, or 3·7 per cent. Brighton, of course, did not offer a field for the rapid development of building and extension which attached to areas nearer the Metropolis; and they were always face to face with very keen competition from the electric light. If, therefore, they were able to show such an increase as he had named, it might be regarded as meeting all reasonable anticipations. The report informed them that during the period under review they had been selling gas at a reduction of 1d. per 1000 cubic feet; and they should remember that this represented between £6000 and £7000 over one year when the dividend was taken into account. Before the existing disturbed order of things declared itself, the Board had further reduced the price of gas by 1d. as from July 1; and this reduction would affect the current half year.

Figures in the Accounts—Capital and Make of Gas.

The Company had something like £133,000 yet to issue in the form of capital stock or loan capital; but it was not likely that the Directors would avail themselves of these powers, inasmuch as it had been their policy to meet the extensions of business from revenue account, and, in addition, to reduce the capital by purchase and cancellation under the special powers given them by Parliament. During last half year there had been spent on capital account £2232; but this expenditure had been qualified to the point of elimination by the charge of £2613 for depreciation. Taking these two items alone, there had been a reduction of over £400 in the capital. Then they would see recorded the effect of the powers he had alluded to, under which they had extinguished during the past half year capital to the extent of £885. In the aggregate £7375 had been dealt with in this way; and the result of this was to bring the capital raised per million cubic feet of gas sold per annum down to the figure of £488, the lowest that it had ever stood at in the history of the Company. In 1910, when they made application to Parliament for these powers to extinguish, if he remembered rightly the capital was £553 per million. So that in four years the capital had been reduced something like £65 per million cubic feet of gas sold—an all-important factor. In the six months under review, they had sold practically 735 million cubic feet of gas. The quantity sold per ton of coal carbonized was 12,444 cubic feet; and the total amount of unaccounted-for gas, which included the gas used on works (and this must be taken in connection with the fact that machinery was driven by gas-engines), was only 3·09 per cent., which was exceptionally low, and certainly showed the make per ton had not been over-stated. Of course, the make per ton might mean a great deal to the engineer and director; but the ultimate criterion was the amount sold per ton. In the case of their Company, this was a perfectly accurate and fully ascertained figure. In the matter of residuals, they had to encounter an unfavourable return as compared with the corresponding period of the previous year; but he thought they had done as well as others. They had lost on every one of the items down to ammoniacal liquor. In their accounts "ammoniacal liquor" appeared where in most cases one found "sulphate of ammonia." The Brighton Company did not manufacture their own sulphate of ammonia; but he might say that certainly for the last half-dozen years this was a matter which had always had the jealous and anxious scrutiny of the Directors, to see if they were losing anything by abstaining from the almost general practice of dealing with their own liquor. But when he told the proprietors that the return per 100 tons of coal carbonized was over £7, he thought they would agree that the Company were not doing badly. While the Directors would at once take steps if they felt they were falling behind in the matter, he did not think that this item was open to criticism. Coals, coke, and oil carbonized had, of course, cost them more.

The Charge for Repairs and Maintenance.

One thing which had to be considered in connection with the results was the allocation for repairs and maintenance. Under this head, on works and plant they had spent 3¾d. per 1000 cubic feet of gas sold. On mains, the figure was 3½d.; on meters, 1d.; and on stoves, 4½d. per 1000 feet. Of course, these were to an extent arbitrary figures; but in the aggregate they amounted to 12·36d. per 1000 cubic feet of gas sold. Dealing with a company selling some 1500 million cubic feet per annum, this was a very liberal deduction to make as a condition precedent to declaring any profit. No profit shown when the accounts had been qualified by such a figure as this could possibly be spurious or weak in any way.

Profit and Loss Account.

The balance carried to profit and loss account amounted to £23,585, which meant a deficiency on the half year of £3686—an amount which would be further enlarged if they continued to appropriate money for the redemption of capital. But it must be remembered, as he said just now, that the price of gas had been reduced by 1d., which at once accounted for the whole thing. Of course, there was a still further reduction to be dealt with in this half year; but the reduction in the cost of coal and oil would meet this again in its turn. After payment of interest on the debenture stock, and other charges incidental to the profit and loss account, they would carry forward £37,569, which would be ample to meet any further slight withdrawal which might be necessary to balance the effect of the reductions in the price of gas, and then again to go forward without any serious diminution. It was hardly necessary for him to emphasize the fact that, in carrying on a business like theirs in Brighton, in acute competition not only with electricity but with coal and oil (particularly coal for cooking), a selling price of 2s. 8d. per 1000 cubic feet was a very much stronger position than 2s. 10d.; and it was well worth any such sacrifices as he had described to secure. With these reductions, they might quite reasonably hope, in normal circumstances, to maintain their rate of expansion, and to slightly increase it.

Reserve and Other Funds.

The reserve fund preserved its very healthy dimensions—amounting to over £68,000; and a marginal note showed how it was invested. Though, of course, it might be subject to depreciation to an extent simply impossible to compute under the present circumstances, yet it had been adjusted to Consols at a value of 80; so that there were no very inflated prices to fall away from. In times like these, invested amounts did give a company a very great deal of stability. The financial situation was almost impossible to describe. It changed from day to day; and it must be perfectly obvious that an undertaking with a large amount of money definitely invested in gilt-edged securities must command a higher degree of confidence than one without these securities, and possibly without any reserve, or with it invested in the business—which was a singularly unfortunate position in such times as they were now passing through. The special purposes fund amounted to a little over £19,000; and this, of course, could be used in any of several directions, though he hoped it would not be necessary. The capital redemption fund showed that £14,384 had been expended on stock of a nominal value of £7375, by far the greater proportion of which was original stock paying the high dividend of 11 per cent. The

net result was that they were getting on to a reduction of £1000 in the amount of dividend payable by the Company as compared with the condition of things before this account was started. In the general balance-sheet, there was an item "Prepayment meter fittings, stoves on hire, &c., £73,073." This was a set-off against the item in capital account, "Balance of capital account, £63,515." It showed they had rather over-spent than otherwise in regard to the capital remaining at their disposal. Nevertheless, the Directors did not think they would have to increase their capital obligations in relation to the public.

THE WAR AND ITS EFFECTS.

So much for purely domestic detail. There were certain matters he must put before them in connection with the generally disturbed conditions they all had to deal with to-day. With regard to the effects of the war, on this particular business these effects were more pronounced than with the generality of companies, inasmuch as theirs was a coast town, and their supplies were brought by water. At first it appeared that the derangement of things would prove very costly; but they had made a temporary arrangement with their contractors by which their coal supplies would continue for the next 91 days—which was the period fixed by the Government regulations. By this arrangement, they would get their coal at an increased cost of something like 1s. 6d. per ton. He could not for the moment say how this compared with the increased rate in respect of Metropolitan supplies. As a matter of fact, the conditions were not strictly comparable. Their Company used smaller steamers (the largest of them only took 900 tons), and their journey by sea was considerably longer than that which turned into the Thames. But their contractors had met them in a very fair spirit indeed; and should the balance of advantage as represented by this 1s. 6d. by good fortune be very much against the Company, the figures, he was sure, would receive consideration by the contractors, and the matter be adjusted equitably between the parties. Meanwhile, though, of course, they did not want to incur additional outlay at this time, there was nothing absolutely prohibitive in this extra amount per ton. As to the effect on the employees, some 111 had been called up in one way or another to serve their country; and the duty had devolved upon the Board of dealing with the families left behind. They had taken no very abnormal or exceptional course, but had done, he thought, much the same as other companies. They would allow the wives one-half the pay of the husbands who had gone away, up to a maximum of 15s. per week; and they had further decided to allow for each child under the age of fifteen, and wholly and directly dependent upon the mother, 1s. 6d. per week. In certain exceptional cases, this might possibly bring a little more money into the home than when the head was there working for the Company; but on an average it tended to preserve practically the payments which those who were concerned were receiving before the outbreak of hostilities. To the single men who had no one dependent upon them, the Directors did not propose to make any allowance for the present, because they could not use it; but the Board would keep their employment open for them as far as they possibly could, and then on their return (should they be in a position to do so) they would try to make them a lump-sum payment so as to set them up again in their normal employment. The cases of single men with aged parents, &c., would be inquired closely into, and each would be dealt with on its merits. Everything possible had already been done to put the works in a state of efficiency. The men had been organized; and the Directors had tried as far as possible to foresee everything likely to affect them at all prejudicially in their business. But, of course, they could not foresee all things. They changed from day to day; and it would be folly to prophesy. "It would," he added, "appear that the European nations have been thrown into the crucible of war. When they emerge therefrom, purified by the trial or ordeal they are passing through, when the metal of their manhood runs into fresh moulds, let us hope and pray that they may take a form so refined and strengthened that it will not be in the power of any man, however exalted, again to destroy or to disturb them." [Hear, hear.] He concluded by moving the adoption of the report and accounts.

Mr. G. W. CAREY seconded the resolution, which was at once unanimously carried.

Proposed by the Chairman, seconded by Mr. A. F. PHILLIPS, dividends were declared for the half year at the statutory rates per annum of 6 and 4 per cent. on the "B" and "C" preference stock, and 11¼ and 8¼ per cent. on the original and "A" ordinary stock.

A CONTRIBUTION TO THE PRINCE OF WALES'S FUND.

The CHAIRMAN announced that the Directors had decided to contribute 500 guineas to the Prince of Wales's Fund. He said that as they were probably aware a specific appeal had been issued from the headquarters of this fund to gas companies asking for their support. He did not suppose that anyone would care to raise the point as to the legality of so contributing; but, speaking from his knowledge of the subject, he personally had not the slightest doubt that in the circumstances such a contribution was strictly legal. "We have," he went on, "general powers; and I do not think it is straining these powers in any degree to make a contribution for the general safety and welfare of the country, upon which our business in its entirety depends. Anything we can do to stimulate our defences and render our security more complete, is as essential to the interests of this Company as to those of any private individual. [Hear, hear.] Therefore I trust we shall have your support in what we are doing."

Mr. H. E. JONES: Do you propose to take it out of the general funds of the Company, or from the fund set aside for shareholders' dividends?

The CHAIRMAN: We shall not take it from the shareholders' dividends, but from the general funds.

Mr. JONES: You secure your supply?

The CHAIRMAN: We secure our existence, if I may say so, in a degree.

The good work of the staff, and the loyalty shown by the men in co operating with the officers, were acknowledged by the CHAIRMAN, who proposed a hearty vote of thanks to them.

Mr. H. E. JONES seconded, and asked the shareholders at the same time to show their appreciation of the services of the Directors. He said it was a pleasure to him to see Mr. Paddon in the chair which his father before him had so long and so worthily filled. The Engineer (Mr. Joseph Cash) he had always admired and respected; and the Secretary was one of the best-known accountants in the kingdom. With reference to the remarks that had been made as to the loss sustained by the Company, Mr. Hesketh Jones had sat with him on another Board where he would indeed have been troubled to-day. He referred to the European Gas Company, whose business was greatly interfered with by the war, and some of whose works were in danger. To Mr. Hesketh Jones both he and his son were indebted for many acts of kindness.

Mr. GARRAWAY RICE seconded the vote to the Directors; remarking that he was glad to hear of the loyalty of the employees. Their experience was the same in the Wandsworth Company. Good treatment was being reciprocated.

Mr. A. W. OKE supported the proposition, and expressed his gratification at the fact that the Company had subscribed so liberally to the Relief Fund. It would be setting an example to other companies in the district.

The vote was heartily accorded, and was duly acknowledged by the CHAIRMAN.

Mr. CASH, on behalf of the officers at the works, said that though they had lost a very considerable number of their men who had joined the Colours, the ranks had been closed-up by those who were left, and the interests of the proprietors were fully maintained.

Mr. BURTON also returned thanks, for the London staff.

OTTOMAN GAS COMPANY, LIMITED.

A Sound Position—Retirement of the Secretary.

The Ordinary General Meeting of this Company was held last Tuesday, at the London Offices, Nos. 59 and 60, Gracechurch Street, E.C.—Colonel JAMES LEGEYT DANIELL in the chair.

The SECRETARY (Mr. A. W. Cooper) read the notice convening the meeting and the certificate of the Auditors; and the report and statement of accounts were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said the Directors appeared before the shareholders in very awkward and difficult circumstances—though not, he was happy to say, difficult up to the present time as regarded their own Company and its prosperity. There were, of course, feelings of uncertainty; but he had strong hopes that everything would go smoothly. Unfortunately, Colonel Stephenson R. Clarke was unable to be with them that day, as he was detained elsewhere on important business not unconnected with the office of High Sheriff. The shareholders had the accounts before them; and really there was very little that he need say in regard to them. The Company never was in a sounder position than to-day. If they took the revenue account, they would find that there was a reduction of something like £2000 in the cost of coal; and that there was an increase in depreciation and renewals of £3278, as a great deal had had to be done under this head. On the other side, the gas rental exhibited an increase of £4245; but residual products and fittings did not show so well as a year ago by £1500. They all knew the difficulties that had been experienced in the market for residual products, and to a certain extent their Company had shared in them. The total quantity of gas made in the period under review was 117,218,000 cubic feet, while the make per ton of coal carbonized was 11,860 cubic feet. As was the case a year ago, they had with them that day Mr. John Gandon, their Engineer and Manager in Smyrna. The Directors had been consulting him on various matters; and he would doubtless be pleased to give the shareholders any information they might desire. They would observe that there was an absence from the end of the report of any statement as to the date on which the payment of the dividend was likely to be made. The Board had, however, arranged that the shareholders should receive it at the usual time.

Mr. H. WARD ANDREWS seconded the resolution, which was carried unanimously, without discussion.

It was then resolved, on the proposition of the CHAIRMAN, seconded by Mr. A. M. PADDON, to pay a dividend for the half year ended June 30 at the rate of 7 per cent. per annum (less income-tax) on the preference shares, and at the rate of 10 per cent. per annum (tax free) on the ordinary shares.

The CHAIRMAN proposed a vote of thanks to the Engineer and staff abroad and the Secretary and staff in London. He remarked that the Company had the good fortune to possess an extremely active, reliable, and hard-working staff. In this connection, there was one special matter to which he had regretfully to refer. They were to lose the services of their old friend Mr. Cooper as Secretary. Mr. Cooper, as they all knew, had for many years been Secretary to another Company in the same offices; and he had been Secretary of the Ottoman Company for the last three years or so. For some time past, however, he had been very poorly, and had suffered a great deal. It was impossible to emphasize too strongly the value which the Directors had always placed upon his services. He had done his best for the Company, and his best was very good indeed.

Mr. L. ANDREWS, in seconding the resolution, remarked that he had known Mr. Cooper for thirty years; while as for Mr. Gandon, he had spoken twelve months ago of the excellent impressions he had gained from a visit to the works at Smyrna.

Mr. GANDON, in returning thanks for the vote, which was heartily accorded, said the Chairman had mentioned that the position of the Company was sound. The shareholders should understand that the undertaking had gone through three years of local war; and a company that could go through such a period, not only without considerable expense and interference with their operations, but with an improvement in its position, was certainly thoroughly sound. He was completing within a month his twenty-fifth year of service with the Company; and it had been his good fortune to witness a great and steady improvement in the situation of the undertaking—an improvement which, he thought, was almost entirely (if not altogether) due to the excellent policy of the Board in not forcing up the dividends, but keep-

ing the works in thorough order and strengthening the financial position. He believed they might hope for the continuance of their prosperity. Of course, it was difficult to-day to speak certainly, with all the troubles they had around them; but he thought very few undertakings were in so sound a financial condition as their own.

Mr. COOPER also acknowledged the vote, and said it was very painful to him to have to send in his resignation. He had been for forty years in the offices as Secretary to another Company.

Mr. A. W. OKE proposed a hearty vote of thanks to the Chairman and Directors, and remarked that he thoroughly endorsed what had been said with regard to the difficulties which the Company had passed through during the last three years. It was an outstanding feature in connection with the Company that, in a time of danger, it had been so prosperous.

Mr. F. W. CHURCH seconded the vote, which was cordially passed; and the CHAIRMAN'S acknowledgment brought the meeting to a close.

OLDBURY GAS-WORKS MANAGEMENT.

[FROM A CORRESPONDENT.]

There have now arisen some new developments in connection with the Oldbury gas undertaking; and the Gas Committee are advertising for a fully-qualified Engineer and Manager, at a salary of £250 per annum.

The position at the gas-works is, however, so far as a representative of the "JOURNAL" can learn, a somewhat remarkable one. It seems that some time ago the District Council accepted a recommendation for the appointment of an Assistant Gas Engineer, in consequence of the illness of the respected Gas Manager (Mr. A. Cooke); and at that time it was understood that certain of his colleagues in the locality were willing to come to his help and to supervise the carrying on of the undertaking. As a matter of fact, it is believed that Mr. Vincent Hughes (the Manager of the Smethwick Gas-Works) generously promised to assist Oldbury through the unfortunate illness of their Manager; and the Council readily approved of this arrangement. But after advertising for an Assistant-Engineer on the instructions of the Council, the Gas Committee, for some reason or another, did not make any appointment.

Mr. Cooke's condition has not improved; and he is now lying in a dangerous condition at his residence at Langley. It is no secret, however, that for some time past the position of things at the Oldbury Gas-Works has caused considerable anxiety among the members of the Gas Committee and the Council, and it has been earnestly hoped on all hands that Mr. Cooke would soon resume his old duties and put matters once more on a satisfactory footing. The members of the Gas Committee at one time had every reason to expect that Mr. Cooke would be eventually restored to a good measure of health and strength; but a few weeks ago he had a serious relapse, and now his condition is giving much anxiety to his family and friends. But it appears that Mr. Cooke has not sent in his resignation as Gas Manager, neither has he been called upon to resign by the Committee; so it may be that the appointment of the fully-qualified man is only of a temporary nature, and that should Mr. Cooke recover he will be able to resume his old position, or probably some new position, in connection with the undertaking. This is the impression among some members of the Council; but the position will no doubt be made clear to the ratepayers at the next meeting, when the new appointment that the Gas Committee will make must come up for confirmation.

Mr. Cooke has been a good and faithful servant of the Council for many years. There has never, so far as can be seen, been any complaint against him; and there is no doubt when he had health and strength he has rendered very valuable service to the town. There is a desire among the members of the Gas Committee and the Council that, if there is any possibility of him resuming his old duties at the gas-works, he should be given the opportunity. At the same time, it should not be forgotten that the Gas Committee had been very patient with him in his illness, which has gone on now for nearly twelve months; and it is only on the understanding that there is no chance of him returning to his duties for a considerable length of time that they have, in the interests of the concern, been forced to take action to appoint a competent man as indicated by the advertisement.

STOCKPORT CORPORATION GAS UNDERTAKING.

Annual Report of the Engineer.

The annual report of Mr. S. Meunier, the Gas Engineer to the Stockport Corporation, on the working for the year ended March 31, contains the following.

The past year has unfortunately not been at all a favourable one for gas departments generally throughout the country; the prices of coal and all materials having been high, while the market for residuals has been a falling one. During the year 63,513 tons of coal were carbonized, on which the extra price paid over the previous year of 1s. per ton represents £3175. The total increases paid since 1911 were 2s. 6d. per ton, or an equivalent of £7939. Coke realized £973 less, though 1200 tons more were sold. Tar, the price of which gradually fell from £2 1s. 2d. per ton to £1 15s. 3d. per ton during the year, showed a deficit of £1197 for about the same tonnage; and ammoniacal liquor, for 700 tons more, was £380 down—or a total reduction on the three main residuals of £2550.

There was also a falling off in the quantity of gas sold, due mainly to the stoppage of works during September and October. The gain made during the period between April 1 and Sept. 30 (which of late years has been the heaviest period throughout the year, and which amounted to 32 million cubic feet) was entirely swept away, with the consequent result that the total sales showed only a very slight increase of 1,100,000 cubic feet, or 0·12 per cent. This falling off is entirely among the public and private lighting consumers; the sales among the prepayment consumers, who now take nearly 23 per cent. of the total sold, and number half of the total consumers, having been fully maintained.

The make per ton is down 800 cubic feet, which necessitated some additional plant being put on during the winter months, and would account for some of the extra quantity of coal used; the remainder being due to the smaller proportion of carburetted water gas made, rendered necessary by the high price of oil. This will account for a proportion of an increased amount of £6005 on coal and £1650 on stokers' wages; the remainder of the former being due to deliveries on contract after March at 2s. 6d. advance over 1911-12 prices. Carburetted water gas shows a reduction in expenditure on oil of £1743 and on wages of £182, with an increase on the cost of materials of £254, a total net gain of £1671, owing to the smaller quantities made.

Increased rates of wages granted to the employees in February, 1912, which were estimated at the time would be from £3000 to £4000 per annum, if not more, represent on the actual payments made for the year ended March 31, 1914, no less a sum than £5232, which should be added to the trading losses so as to compare the two years' workings of 1911-12 and 1913-14. There has been a decrease of nearly 1 per cent. in the unaccounted-for gas, and it is hoped that this favourable feature may be continued.

As regards the prospect for the current year, it is hoped that the normal increase in the gas consumption will be resumed, and that there will also be an easing off in coal prices; but against gains from these must not be overlooked the prospects of the residuals market, which at the present moment are not promising. Sulphate of ammonia, upon the value of which is based the price for ammoniacal liquor, is lower now than it has been since 1902, while coke and tar are barely holding their own. Coke as a fuel for steam-raising is being tried in some towns with good results; and it would assist the department materially if some of the manufacturers in the district could be induced to try the experiment fully.

MANCHESTER CORPORATION'S EMPLOYEES' SCHEME.

Supplementing the particulars given in the "JOURNAL" last week regarding the question of the employees in the Gas Department contributing to the Lord Mayor's appeal for funds towards the National Relief Fund, we are officially informed that at a meeting of the principal officials held yesterday (Monday) week, it was decided to invite regular, voluntary, weekly contributions by all members of the staff during the continuance of the European war.

Mr. Frederick A. Price, the Superintendent of the Gas Department, was unanimously appointed Chairman of the Special Committee; and in a circular which he has sent through the department he states that, "in making this appeal, the Committee feel convinced that all the officials desire to do their duty in this crisis, and while recommending the scale below as a broad and equitable basis of contribution for the guidance of contributors, the amounts are quite optional."

The scale referred to is:

Salaries or Wages per Week.	Weekly Contribution.
Under 10s.	0s. 1d.
10s. and under 20s.	0 2
£1 0 0 and under £1 10 0	0 3
1 10 0 ,, 2 0 0	0 4
2 0 0 ,, 2 10 0	0 5
2 10 0 ,, 3 0 0	0 6
3 0 0 ,, 3 10 0	0 9
3 10 0 ,, 4 0 0	1 0
4 0 0 ,, 4 10 0	1 3
4 10 0 ,, 5 0 0	1 6
5 0 0 ,, 5 10 0	1 9
5 10 0 ,, 6 0 0	2 0
6 0 0 ,, 6 10 0	2 4
6 10 0 ,, 7 0 0	2 8
7 0 0 ,, 7 10 0	3 0
7 10 0 ,, 8 0 0	3 4
8 0 0 ,, 8 10 0	3 9
8 10 0 ,, 9 0 0	4 2
9 0 0 ,, 9 10 0	4 7
9 10 0 , 10 0 0	5 0

A foot note states that it is recognized that the scale might be found by some (for reasons of their own) to be excessive, while others might desire to supplement the amount suggested.

The amounts collected are to be paid over weekly by the Hon. Treasurer, Mr. Thomas Williams, the Cashier of the Gas Department, to the Lord Mayor, the Rt. Hon. Daniel M'Cabe, J.P. The first subscriptions were paid last Saturday. The Hon. Secretary to the Executive Committee of the fund is Mr. G. W. Kaye.

GAS AND ELECTRICITY SUPPLY IN MASSACHUSETTS.

The twenty-ninth annual report of the Massachusetts Gas and Electricity Commission, covering the year to June 30, 1913, has been issued. The following are some particulars from it contained in the "American Gas Light Journal."

There were in operation in the above-named period 67 gas companies, and the result of their working, compared with that for the preceding year, was:

	1913.	1912.
Income	$14,091,982	$12,858,596
Expenses	10,112,265	9,154,400
Difference	$3,979,717	$3,704,196
Result after meeting dividend charges, &c.	6,121*	352,989†

* Deficit. † Surplus.

Seven companies did not earn expenses, against thirteen in 1912; and twelve did not earn enough to warrant a dividend declaration.

There were in operation 55 electricity supply companies, in regard to which the report furnishes the following particulars:

	1913.	1912.
Income	$15,128,212	$13,580,031
Expenses	8,995,055	7,976,449
Difference	$6,133,157	$5,603,582
Surplus after meeting dividend charges, &c.	29,698	232,587

Six companies did not earn expenses, against three in 1912; while sixteen companies, against twelve in 1912, failed to earn enough to warrant a dividend declaration.

Owners of municipal plants in three cities and 33 towns, of which four supply both gas and electricity, and the others electricity, report as follows:

	1913.	1912.
Electricity.		
Income	$1,052,498	$916,227
Expenses	839,176	765,910
Difference	$213,322	$150,317
Surplus after depreciation, &c.	2,710	68,106
Gas.		
Income	$290,188	$282,118
Expenses	212,244	205,813
Difference	$77,944	$76,305
Surplus after depreciation, &c.	71,009	60,605

The actual surplus of all the gas companies, according to balance-sheets, was $7,891,268, or 20·63 per cent. on the capital, compared with $9,257,043, or 25·41 per cent., the previous year. A sum of $3,599,451 was paid in dividends by 54 gas companies, or 9·6 per cent. on the capital stock. Fourteen companies reduced the price of gas; and the average price paid by consumers was 86·4 c., against 85·7 c. in 1912.

The actual surplus of the electricity companies was $3,740,000, or 12·22 per cent. on the stock, against $3,536,198, or 13·27 per cent., the previous year. Forty-one electricity companies paid $3,012,288 in dividends, or 9·9 per cent. on the stock.

PRIZE OFFERED FOR A FIRE-PLACE GAS-HEATER.

A Joint Committee has been formed by the American Gas Institute and the National Commercial Gas Association (of America) to deal with the subject of fire-place heaters; and they are offering a prize of $150 for the best design of one to burn gas.

In their pronouncement on the subject the Committee say: There are several types of heaters on the market which are fairly satisfactory from the standpoint of heat production, but do not meet the requirements from the standpoint of appearance. The Committee want a design of heater that may be placed in the open fire-place of the library, living-room, or dining-room of an artistically furnished dwelling, which will be appropriate for the purpose, and artistically consistent with the furnishings of the room. The appearance when unlighted is of equal importance with the appearance when lighted; and in awarding the prize, these two features will be given equal prominence.

The heaters now on the market are either palpable imitations—such as gas logs—or are of such shapes, or composed of such materials, as to have a cheap appearance, inconsistent with the modern domestic interior. Some of the fireplace heaters that are built in England are more suggestive of a possible solution than anything that has been manufactured in America.

The Committee realize that the class of architectural draughtsmen which is likely to enter into this competition has only a slight knowledge of the principles of gas combustion, and that the inherent difficulty in the problem is to obtain a design, the appearance of which, when unlighted and when lighted, is satisfactory, and which will at the same time permit of the proper combustion of the gas, and be efficient in the radiation of heat. It may be said, however, that gas-burners may be made in almost any shape, and that it is, generally speaking, possible to reconcile an adequate handling of the gas with a wide variety of designs of heaters. It is therefore suggested that the first thought should be given to the production of a design of heater which is artistically appropriate in the fireplace when the heater is unlighted—it being assumed that the technical requirements may be afterwards met by the engineers of the Committee,

As a guide to the contestants, the following "technical facts" are given: The burners may be of the illuminating or atmospheric type. In the former, there is always a certain amount of flicker in the flame. The flame must not be allowed to come in contact with metal or other material, but must burn freely into the atmosphere. In burners of the atmospheric type, the gas-flame has no illuminating value; and this flame may be allowed to touch metal or other material, without any danger of depositing carbon. This contact of the flmae with other material is generally accompanied by the emission of some odour. With all types of burners, however, it is the intention to have the products of combustion from these gas-fires ascend through the flue. The principal heat-giving requirement is that as much as possible of the heat that is generated by the gas combustion shall be emitted from the heater in the form of radiant heat. The yellow flames of illuminating burners radiate considerable heat, but the blue flames from atmospheric burners radiate very little heat. Their usefulness depends on their ability to make hot some metal (or other material) composing the heater, which when hot is a good radiator, This is on the same principle that heat is radiated from the hot ashes, fire-brick floor, and back of a fireplace with a wood fire. The gas log is an excellent radiator, as in it the surface of the log, composed of iron or of mastic material, is heated by the small gas flames, and when so heated, either of these materials is an excellent heat radiator.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

The town of Aberdour—a favourite holiday resort on the Firth of Forth, between Burtisland and Inverkeithing—has just been provided with a supply of gas by the Cowdenbeath Gas Company, Limited. A 4-inch high-pressure main has been laid from Cowdenbeath (which is about six miles inland, and 400 feet higher than Aberdour), *viâ* Crossgates and Fordell; and the supply to the town is regulated by a reducing governor. A gasholder is being erected by Messrs. Henry Balfour and Co., of Leven; but it will not be ready till October. The public lighting is under the Dunfermline District of the Fife County Council, and a ten years' contract has been concluded for the street lighting, which was brought into use on Saturday, the 15th inst.—60 lamps in all having been erected. The whole work was entrusted to the Gas Company, who have converted the old oil-lamps into gas-lamps, and have fitted throughout Messrs. Alder and Mackay's storm-proof lanterns and automatic lighters. The lamps are fitted with the new "Mundus" nozzle and mantle. The townspeople are delighted with the results, and are showing their appreciation of a gas supply by clamouring for meters and cookers. This is the seventh installation of special district public lighting carried out by the Gas Company's Manager (Mr. J. S. Scott) for the Fife County Council; and in every case the "A. & M." lighters and lanterns have been installed.

At a recent special meeting of the Dunoon Town Council, the rates for the current year were fixed at 1s. 7d. on owners and 2s. 6½d. on occupiers; being an increase of ½d. in the pound. It was decided to raise the price of gas by 2½d. per 1000 cubic feet; bringing it up to 4s. 2d.

The second annual meeting of the Banff Gas Company was held at Banff on the 15th inst.—ex-Provost Munro, the Chairman, presiding. The Directors' report, with a statement of the past year's transactions, and the Auditor's report were submitted. The report set forth that the net profit for the year, after providing for all charges and making allowance for depreciation, was £473, to which fell to be added the balance brought forward; making £534. This the Directors recommended should be disposed of (1) in paying a dividend of 5 per cent., free of income-tax, on the share capital, which would absorb £255; (2) adding to reserve account £150; and (3) carrying forward to cover a reduction in the price of gas for lighting purposes, which the Directors have resolved to bring down to 5s. 10d. per 1000 cubic feet, £129. A change in the method of management was deemed by the Directors expedient in the interest of the Company. To enable the Gas Manager to devote his whole time and attention to manufacture and the oversight of the works and plant, he was relieved of the clerical work, and a Secretary and Treasurer was appointed to take charge of the financial department. The Directors expressed the opinion that the results had justified this step. More gas and residuals had been produced from a smaller quantity of coal; and but for the sharp rise in the cost of coals there would have been a substantial addition to the profits of the year. The Chairman moved the adoption of the report, and the motion was agreed to; and it was formally resolved to declare a dividend of 5 per cent. on the net share capital.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Aug.* 24.

There is no change to report in the value of tar products. Business continues practically at a standstill. Sixties crude carbolic acid has been done at 2s. 6d. net per gallon, casks free.

For sulphate of ammonia there is little inquiry, and to-day's value is not below £10 15s. net for 25 per cent. quality, filled into buyers' bags at makers' works. Shipments have been made; and it is expected to resume operations in other directions shortly.

Tar and Tar Products in the Provinces.

Aug. 24.

With reference to the market for tar products, owing to the present conditions it is almost impossible to name prices for the various articles. Very little business is being done; and there is a considerable difference in values according to the conditions surrounding the sale. In crude carbolic, business is reported at prices varying from 2s. 4d. to 2s. 6d. per gallon; creosote, at prices which were in vogue before the war commenced; and benzol and naphthas, from 10d. to 1s., according to position of delivery.

Sulphate of Ammonia Prices in the Provinces.

LIVERPOOL, *Aug.* 22.

In consequence of freight room for export orders still being difficult to obtain, business in this article has continued to be restricted throughout the week. A few transactions have, however, taken place at reduced prices, and the nearest values are now £10 12s. 6d. per ton f.o.b. Hull, £10 13s. 9d. f.o.b. Liverpool, and £10 15s. f.o.b. Leith. No trading has been reported for future delivery; the ideas of makers and buyers having been too far apart to permit contracts to be put through.

From another source, it is reported that the prices of sulphate of ammonia are quite nominal.

Nitrate of Soda.

There is no change in this market, and holders on spot repeat quotations at 11s. 3d. per cwt. for ordinary quality, and 11s. 6d. per cwt. for refined.

COAL TRADE REPORT.

Northern Coal Trade.

The coal trade is still impeded by the difficulty of dealing on a cash basis; but the position is slightly better, and the exports to neutral countries are a little fuller. Steam coals are being sent to Scandinavia—often in steamers which belong to Norway. Best Northumbrians are easier at 13s. 9d. to 14s. per ton f.o.b.; second-class steams are 12s. per ton; and steam smalls are firm at 10s. per ton—a relatively high price. In the gas coal trade, the demand shows slight improvement, both for home and some foreign users; but the fact that cash on shipment is the basis that sellers insist on limits business as yet, and freights are still high to some of the Mediterranean ports. Best Durham gas coals are from 12s. 9d. to 13s. per ton f.o.b.; and second-class gas coals are also easier at 11s. 3d. to 11s. 6d. per ton f.o.b. There is no alteration of moment in the price of "Wear specials." There is little news of any gas coal contracts at present; but the working time at collieries producing gas coal is fuller than that at the steam coal collieries, some of which have only worked about two days a week since the war stopped so much of the exports. Coke is firm for furnace kinds. The exports of gas coke are limited, and the price is easier, though the production of this article is rather limited.

Melton Mowbray Gas Company.—The annual meeting was held last Friday, when a very successful year was reported. The balance-sheet showed a balance on profit and loss account of £5818; and it was decided to pay the usual dividends of 7½ and 5 per cent. The business is growing; and during the last ten years there has been an increase in make of 24 million cubic feet—the make now reaching 53 millions.

Leicestershire Water Supply.—The needs of many Leicestershire townships in the matter of water supply have lately been brought under notice; another case being dealt with by Major C. E. Norton, an Inspector of the Local Government Board, at an inquiry conducted by him last Tuesday at Burbage, in reference to the application of the Urban Council for sanction to borrow £4000 for works at that place to meet the wants of Hinckley parish. Mr. E. H. Crump (the Council's Surveyor and Water Engineer) explained that it was proposed to lay three miles of main, and to make a charge of 9d. per 1000 gallons.

Harrow and Stanmore Gas Company.—The report of the Directors, which will be laid before the shareholders at the meeting next Tuesday, states that during the past half year there has been a great development in the business of the Company; but the high price of coals and low value of residuals prevented an increase in the profits. The balance of profit and loss account is £12,110. The Directors recommend that dividends be declared for the half year ended June 30 at the rate of 5½ per cent. per annum on the 5 per cent. ordinary stock, and of 5 per cent. per annum on the 5 per cent. preference stock, both less income-tax, leaving £5502 to be carried forward.

Bridport Gas Company.—At the annual meeting last Tuesday a dividend of 7 per cent. was declared and £100 was added to the reserve. During the past year 2745 tons of coal were carbonized; and the sales of gas were 29,484,000 cubic feet. A further increase of salary, in addition to a bonus, was voted to the Manager, Mr. W. H. Reed. The Directors, in their report, stated that they "are making constant efforts to ensure an efficient supply of gas to all parts of the town, and where necessary larger mains are laid to supersede small or worn-out pipes, which has entailed great expense, and there still remains a considerable amount of work to do in this direction."

Southgate and District Gas Company.—The report for the half year ended June 30 (to be submitted at the meeting on Thursday) states that, in comparison with the corresponding half of 1913, the sale of gas shows an increase of 4,238,400 cubic feet, or 4 per cent.; but the revenue from residual products is £841 less—the reduction being chiefly due to the fall in the market values of coke and ammonia products. After providing for interest charges, &c., there remains a balance of profit of £7607; and the Directors recommend dividends for the half year at the maximum rates. This appropriation will require the sum of £3900, and leave a balance of £3707 to be carried to the credit of the profit and loss account for the current half year. The price of gas was reduced from 3s. 4d. to 3s. 2d. per 1000 cubic feet as from March 31 last. At a special general meeting, the sanction of the proprietors will be asked for the conversion of the original ordinary, additional ordinary, and 5 per cent. preference shares into original ordinary, additional ordinary, and 5 per cent. preference stock.

Bishop's Stortford, Harlow, and Epping Gas Company.—The seventh half-yearly meeting of the Bishop's Stortford, Harlow, and Epping Gas and Electricity Company will be held to-morrow (Wednesday), when dividends ranging from 4 per cent on the preference stock to £5 14s. per cent. on the ordinary stock will be recommended by the Directors. Compared with the first half of 1913, the sale of gas increased last half year by 3,432,100 cubic feet, or 6·2 per cent. The balance to the credit of the revenue account for the six months is £3332. After charging the sum of £665 for interest and income-tax, an amount of £2667 is added to the profit and loss account, making the balance available for the payment of dividends £3421. These will absorb £3220, and leave a balance of £201 to be carried forward. The profits of the half year were seriously affected by the continued excessive cost of coal, and by a very marked decline in the value of residual products. In regard to the cost of coal, some relief has, the Board say, been secured for the ensuing twelve months under contracts recently entered into, but prices are still abnormally high. During the half year £6000 of 5 per cent. preference stock and £950 of 4 per cent. debenture stock were issued, and the proceeds, amounting to £6950, credited to the capital account. The report concludes: "The Directors, having decided to give effect to the statutory powers conferred on the Company for the supply of electricity in Bishop's Stortford, have entered into contracts for the construction and installation of the necessary generating and distributing plant."

Salisbury Gas Company.

Mr. George Fullford, in moving, at the annual meeting of the Company last Wednesday, the adoption of the report and accounts, and the payment of the usual dividends, said that though good and progressive business had been done during the year, things were not quite so satisfactory as usual. This was the general experience throughout the country, so it was no matter for surprise. Coal had cost more; and while current contracts indicated a return toward normal prices, a high authority had expressed the opinion that permanent relief could not be expected until a more satisfactory basis of remuneration was adopted for those engaged in the actual operations incidental to coal mining. Coke and tar had done fairly well, but there had been a large drop in the market value of sulphate of ammonia. The works and plant were completely equipped with modern appliances; the large manufacturing, distributing, fitting, and maintenance staff were fully employed; and he was able to congratulate the shareholders on the sound and satisfactory character of the business, notwithstanding the special difficulties which they, in common with other gas companies, had met with during the past year. The war had deprived the Company of the services of eleven men. Every care would be taken to ensure complete reinstatement on return; and the Directors were assisting the wives and children belonging to the absent ones. The motion was carried; and the thanks of the shareholders were accorded to the Chairman, Directors, and officers and employees of the Company for their services last year. Mr. Norton H. Humphrys (the Engineer), in responding for the staff, said that, though they had experienced, in connection with the daily routine, the difficulties usual to times of general excitement, they were able to say "business as usual."

London County Council Electricity Scheme.—The London County Council have suggested to the corporations and councils concerned in their proposed electricity scheme (which has been described and discussed in our pages recently) that a conference should be held in October to go into details prior to the Council's application for parliamentary powers.

Barnet District Gas and Water Company.—The proprietors of this Company will hold their half-yearly general meeting to-morrow. The Directors will report that the balance standing to the credit of the profit and loss account for the half year to June amounts to £35,730, out of which a dividend is recommended at the rate of 9 per cent. per annum on the "A" and "C" stocks, 8 per cent. on the "B" stock, and £6 6s. per cent. on the "D" capital gas and water stocks. The Engineer (Mr. F. J. Bancroft, B.Sc.) reports that the works have been maintained in a thoroughly efficient state. The price of gas was reduced from 3s. 4d. to 3s. 2d. per 1000 cubic feet as from Ladyday.

The Gas-Rate in San Francisco.—A few months ago the gas-rate fixed for San Francisco by the Board of Supervisors was 75 c. per 1000 cubic feet. This is now declared to be unconstitutional, void, and confiscatory, according to a report presented by Mr. H. M. Wright, the United States Master in Chancery. The report has caused some surprise to the authorities, as in May last, in a preliminary draft, Mr. Wright said he did not think 75 c. per 1000 cubic feet confiscatory. He now explains that he was in error as to the net income of the Pacific Gas and Electric Company, which he has found to be $627,577 instead of $722,468; and that the proprietors are getting only 5·21 per cent. on their investment, and should be entitled to 6 per cent. He recommends that an injunction should be issued restraining the city from enforcing the 75 c. rate. The Company have been collecting 85 c. under the terms of a temporary injunction; and the amount in excess of the rate fixed by the Board of Supervisors has been impounded, to a total of $284,325. The report goes to a judge for final decision.

North Middlesex Gas Company.—The proprietors held their half-yearly general meeting yesterday (Monday), when the accounts presented showed that, as compared with the corresponding half of 1913, the sale of gas increased by 17,121,000 cubic feet, or 12·7 per cent., and the revenue from residual products by £951. The net profits for the half year, after charging interest, income-tax, &c., amounted to £5094, which, with £4584 brought from the previous half year, made the disposable balance £9678. The Directors recommended dividends at the following rates: On the preference capital, 5 per cent. per annum; on the "original" ordinary capital, 11 per cent. per annum; and on the "additional" ordinary capital, £7 14s. per cent. per annum. The sum of £476 was carried to the reserve fund. This appropriation amounted to £4910, and left a balance of £4768 to be carried forward. It was stated that the sum of £12,575, the proceeds of an issue of £8920 of 5 per cent. preference stock and 250 "additional" ordinary shares sold by auction on May 5, had been credited to the capital account. The Board pointed out that the half-year's revenue had to meet the full effects of abnormally high prices of coal and oil, and also of a reduction of 2d. in the price of gas (from 3s. 4d. to 3s. 2d. per 1000 cubic feet) as from March 31.

Maidstone Gas Company.—At the annual meeting of this Company on the 13th inst., the Directors reported that the accounts for the year ending June 30 showed that, after providing for all fixed charges (including £2000 depreciation in respect of stoves and fittings) and debenture interest, there remained for distribution a balance of £15,860. The Directors recommended a dividend of £3 12s. 9d. per cent. for the half year to June, which, with the interim dividend at the same rate paid last March, makes £7 5s. 6d. per cent. for the year. The sale of gas for the year again showed a gratifying increase over the preceding twelve months. Considering the high price of coal (with one exception, the highest in the history of the Company) and the lower market prices for coke and ammoniacal liquor, the trading profit for the year appeared to the Board to be satisfactory. The sum of £1831 (the full amount allowed under the Company's Act) was again transferred from the revenue account to the renewals fund. During the year the Directors placed contracts for the renewal of the stoking machinery; and the work is proceeding satisfactorily. It is hoped the plant will be in full operation by the early winter. The buildings, plant, and mains have been maintained by the Engineer and Manager (Mr. Frank Livesey) in good working condition out of revenue.

A Borough Engineer for Salford.—The Salford Council met last Wednesday to consider whether they should advertise for a successor to the late Mr. Joseph Corbett, the Borough Engineer, who died in October last. Alderman Jenkins proposed, and Councillor Mather seconded, a resolution of the Finance Committee recommending the appointment of a Borough Engineer and Surveyor at a salary of £900 per annum, rising (subject to satisfactory service) by biennial advances of £100 to a maximum of £1100. After a discussion extending over nearly three hours, the recommendation was adopted.

Barnsley Gas Company.—In their report for the year to June 30 the Directors recommend that, in addition to the interim dividend paid on March 1, a further dividend shall be paid on the 1st prox. of 5 per cent. on the general capital stock and "F" shares, 3 per cent. on the "C" (preference) shares, and 3½ per cent. on the "D," "E," and "G" shares, less tax in each case. The balance-sheet shows that the amount brought forward was £5628, and the balance carried to profit and loss account was £7895—together £13,523. After payment of the dividends recommended there will remain to be carried forward £5613.

Firemen Overcome by Gas in a Cellar.—An explosion, believed to have been caused by the fusing of an electric cable, occurred early on the 11th inst., at the premises of a baker in High Street, East Ham. Immediately after the explosion all the lights went out, and a volume of smoke issued from the cellar into the shop. The fire brigade were called out, and three firemen who descended into the cellar were overcome by an accumulation of gas. Two recovered quickly, but the third had to be taken to the hospital. A man who had gone down to the cellar to turn off the gas at the main was pitched violently backwards by the explosion, and was rendered unconscious.

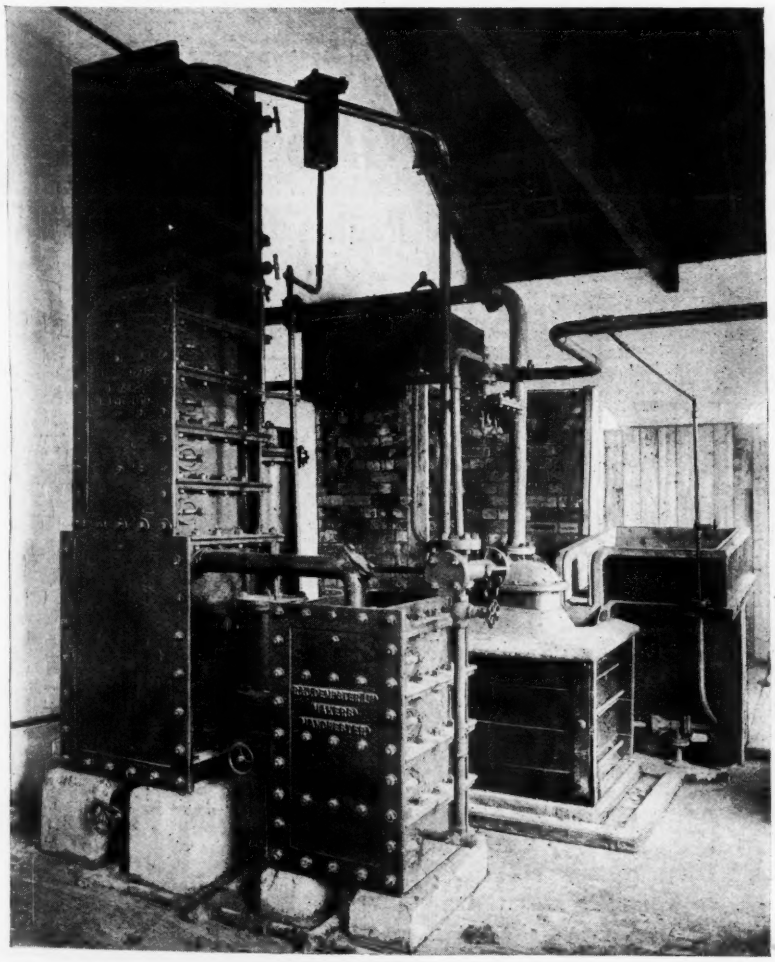
Southend Gas Company.—The report of the Directors to be presented at the half-yearly meeting to-day states that 209,695,000 cubic feet of gas has been sold in the past six months, which, compared with the corresponding period of last year, shows an increase of 17,256,700 cubic feet, equal to 8·96 per cent. The number of consumers has again increased; there being 17,835 on June 30, of which 12,463 had automatic meters. During the half year the total increase was 621. The number of gas cooking and heating stoves is increasing; and satisfactory sales of outside lamps (high and low pressure), geysers, &c., are reported. The Bill in Parliament submitted to the proprietors at the special general meeting held on Feb. 24 received the Royal Assent on the 7th inst. The high price of coal and decreased amount received for residual products have adversely affected the revenue account balance. The profit and loss account shows the sum of £9626 available; and it is recommended that a dividend be paid on the original consolidated and new ordinary stocks at the rate of 5⅛ per cent. per annum, and on the new ordinary "B" stock at the rate of 5½ per cent. per annum (all less income-tax), which will absorb £8418, and leave £1208 to be carried forward. The report of the Manager (Mr. F. Clark) states that 895 yards of low pressure main-pipes have been laid, and 1327 yards of high-pressure mains—making a total of 79½ miles.

Belfast Gas Undertaking.—The accounts of the Belfast Corporation for the year ended March 31, which were issued in volume form last week, give the gas undertaking as responsible for £467,000 in the municipal debt, and show that the undertaking contributed £21,000 (out of a total of £29,000 from productive trading undertakings) towards the relief of the rates.

Gas Appliances on Hire-Purchase in Glasgow.—Regarding the report of the Glasgow Corporation Gas Committee as summarized in last week's issue of the "JOURNAL," Mr. Ralph Halkett, the Commercial Superintendent of the Gas Sales and Distribution Department, writes: "It is stated that 81 circulators were issued on hire-purchase. I think it will be interesting to note that the hire-purchase system was only inaugurated in the department about twelve months ago. Therefore the number stated above is actually the number of circulators on hire-purchase since that time. In addition to this, during the last twelve months the department has sold outright between 400 and 500 gas-heated water circulators."

Thurnscoe Public Lighting.—The Thurnscoe District Council at a meeting last week passed the following resolution in regard to the assumption by the Wath and Bolton Gas Board of the local lighting undertaking: "That the Council accept the offer of the Wath and Bolton Gas Board for providing and maintaining the public lighting of this district for 3933½ hours per lighting season, at £3 7s. 6d. per year for three years, provided that, if required, the Council may adopt the alternative proposal No. 1 for 4302 hours' lighting at £3 15s. per burner per season; that the Gas Board be requested to commence public lighting as early as possible; and that a Sub-Committee inspect the lighting arrangements of the district and report."

Wellingborough Gaslight Company, Limited.—The ordinary general meeting of this Company was held yesterday (Monday). The Directors reported that the balance-sheet for the half year to Midsummer showed favourable results, notwithstanding the higher cost of coal. Contracts, they say, are being made for the ensuing twelve months at somewhat lower prices; "but it is doubtful if this reduction will be sufficient to balance the serious drop in the price of residuals." The Directors having carefully considered the proposal of the Manager (Mr. J. T. Lewis) to provide for a supply of high-pressure gas, decided to put the work in hand at once, to be ready for use next winter. The cost of the mains and services for the purpose was provided out of revenue, which accounted for the smaller amount shown as profit for the past half year; but as there was an ample balance brought forward in the profit and loss account, no diminution of dividend has been caused. The subdivision of the "original" £25 shares into five shares of £5 each, which was effected in 1909, proved very advantageous, it was stated; and it was considered desirable to divide the £10 shares of "additional" capital into ten shares of £1 each. This is found especially convenient for the profit-sharing scheme of the Company, as workmen are enabled to become shareholders much more quickly than at present. The Directors submitted a special resolution on the subject.



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Herne Bay Water-Works Company.—The half-yearly meeting of this Company was held last Tuesday week at the offices, 38, Parliament Street, S.W. The Directors reported that the income for the past half year, after making provisions for empty houses and irrecoverable rates, amounted to £3034, and the expenditure to £1270. The profit and loss account (including the sum brought forward) showed an amount of £2667, and after providing for interest on the debenture stock, &c., the amount available for dividend was £2378. This the Directors recommended should be applied to the payment of 6 per cent. on the preference and ordinary stocks; leaving a balance to be carried forward of £940.

Overhanging Lamps at Dorking.—The Dorking Urban District Council have, on the recommendation of the Roads Committee, decided that the position of nearly fifty lamps should be altered by the Gas Company at a cost of 10s. per lamp—the Council to do the work of reinstatement of the roads. These are lamps which, projecting over the highways, are a source of danger to those riding in motor omnibuses. One member thought the omnibus company should bear a portion of the expense; but it was pointed out that the Council were responsible in the first place for obstructing the highways by erecting the lamps in their present position, and it was in order to relieve themselves from future liability in case of accident that the Committee made the recommendation.

Gas Charges at Halifax.—It was mentioned in the "JOURNAL" of the 11th inst., that the Halifax Town Council had adopted a recommendation of the Gas Committee to reduce the charge for gas supplied to large consumers. The following is to be the new scale: Accounts under 220,000 cubic feet per quarter, 2s. 1d. per 1000 cubic feet; 220,000 and under 450,000, 2s.; 450,000 and under 750,000, 1s. 11d.; 750,000 and upwards, 1s. 8d. Where the consumption exceeds 6,000,000 cubic feet per annum, the price for such excess consumption will be 1s. 4d. per 1000 cubic feet up to 12,000,000 cubic feet, and the price for any excess consumption over 12,000,000 cubic feet will be 1s. 1d. per 1000 cubic feet, subject to a discount of 1d. per 1000 cubic feet on accounts paid within the time to be prescribed on the demand note.

The Lighting of Bognor.—The Bognor Ratepayers' Association are of opinion that during the war crisis some of the lights in the town should be left burning all night; and they have written to the Urban Council urging that this should be done. The Gas Company, on the other hand, asked that, in view of the disturbed condition of the coal market and uncertain prices, the Council should economize as much as possible in the public lighting of the town. On a division, the Council decided that one-third of the lamps should be left alight. The discussion produced one argument which is worthy to be placed on record. It is reported that "Mr. Gibbs thought they would be playing into the hands of the enemy by having more light. It would give evil-disposed people a chance to see what they were about." And it used to be said that a gas-lamp was as good as a policeman!

Increased Water Storage and Filtration Plant for Cardiff.—The Water-Works Committee of the Cardiff Corporation have decided, subject to the approval of the Local Government Board, to proceed, at an estimated cost of £20,000, with the construction of the new service reservoir at the Heath and with the filters at the same place, in order to provide employment.

The Fatal Accident at the Leek Gas-Works.—In the "JOURNAL" for Aug. 11 [p. 354], particulars were given of an accident which occurred at the Leek Gas-Works on July 29, which culminated in the death on Aug. 4, from injuries caused by an explosion, of Albert D'Arcy, a fitter, employed by the Leek Gas Department. D'Arcy was engaged in removing a valve in the carburettor house when the fumes came in contact with a gas-stove, owing to the removal of a brick in the wall which separated the rooms. The inquiry was adjourned by the Coroner (Mr. T. B. Cull) to see if any evidence could be found to show who had removed the brick. A fitter said he had removed the brick previously, in order to screen a long length of piping; but he did not know who had done so on this occasion. Mr. R. H. Ginman, the Gas Engineer, in reply to Mr. Pendock, H.M. Inspector of Factories, said he had recommended in his report to the Council that the plant should be removed to a less dangerous place on the works; and he thought this would be carried out. The Jury returned a verdict that the deceased met his death by an accident caused by benzol fumes coming in contact with a naked light.

Mr. Andrew Stephenson, of No. 171, Palmerston House, E.C., asks us to intimate that the business for the sale of "Volcanic" fire cement is being carried on exactly as usual; and as he has distributing depots all over the country, he is in an excellent position for executing orders without delay.

Mr. Herbert N. Clark, of No. 28, Brooke Street, Holborn, E.C., intimates that, owing to all his goods coming from America, he is in a position to supply, for immediate delivery, and at the usual prices, the well-kown Humphrey inverted gas arc lamps and fittings—for which he is the sole representative in Great Britain.

The James Keith and Blackman Company, Limited, of Farringdon Avenue, E.C., forward copies of two pamphlets they have just issued dealing with the Keith Light. These contain, in addition to useful information regarding the system, a number of photographs illustrating the uses of high-pressure lighting, and its excellent effect. One of the pamphlets relates specially to mill lighting, in which direction the firm have done a very large amount of work.

At the last meeting of the Barnsley Borough Council it was decided to exercise the powers conferred upon the Council in connection with the testing and stamping of gas-meters, under section 42 of the Barnsley Corporation Act, 1914, and to obtain the sanction of the Board of Trade to the use of the plant attached to the works of Messrs. Hutchinson Bros., which is at present employed by the Leeds City Council for the purpose mentioned.

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The Gosport Water Company are taking over the supply of water to Lee-on-the-Solent, which hitherto has been furnished locally; and for laying trunk mains in the district and to Swanmore, and for increasing the source of supply from the headings at Goberton, the Company's capital is to be increased by £12,000.

The Gas Lighting Improvement Company, Limited, of Salisbury House, E.C., announce that their current retail prices, in England and Wales, are, for "Carburine" motor spirit, 1s. 9d. per gallon in sealed 2-gallon blue cans; "Carburine 2" motor spirit, 1s. 7d. per gallon in sealed 2-gallon blue cans; and "Glico" motor spirit, 1s. 6d. per gallon in sealed 2-gallon yellow cans.

The Thermal Syndicate Limited, of Wallsend-on-Tyne, state that they are in a position to supply "Vitreosil" material promptly, as it is entirely made in their Wallsend works. In view of the tremendous dislocation of business, owing to the war, and the lack of supplies of glass and porcelain from Germany and Austria, doubtless this announcement will prove of interest to readers.

The Dey Time Registers, Limited, of Queen Victoria Street, E.C., have amalgamated with the International Time Recording Company, Limited, of City Road, E.C., and both firms will give up their present premises. The combined businesses will be known as the "International Time Recording Company, Limited," and will occupy the entire five-storey building Nos. 30-32, Farringdon Road, E.C.

The Lea Bridge District Gas Company are about to remove their London office to Nos. 63 and 64, Chancery Lane, W.C.

The Wath Urban District Council have decided to accept the second of four suggestions of the Gas Board in respect of the taking over of the lighting undertaking by the latter body. This scheme provides that the Council shall retain the control of the lighting, and that the Gas Board will light fully for nine months, and for the remaining three months at half strength—namely, one-half the lamps to be lighted while the remaining half are being cleaned and repaired—for £3 10s. per lamp for one year, or £3 7s. 6d. per lamp for three years.

Headed "Business as Usual," Messrs. Fletcher, Russell, and Co., Limited, have issued a circular-letter to their customers in these words: "In view of the possible dislocation of trade arising from the war, we are most anxious to keep as many men employed as possible, and thus help to prevent the privation and distress which are imminent, and assist in maintaining the trade of the nation. For these reasons, therefore, we are writing to ask you to favour us with any further orders you may be able to place. We shall, of course, be pleased to keep the goods, so prepared, in stock, though we would much prefer to make delivery in order that your own men may be regularly employed. We would like you to believe that in making this request we are actuated solely by the wish we have expressed—viz., to find employment for our men as well as those of our friends."

GAS COMPANIES IN THE STOCK EXCHANGE.

The Stock Exchange remained closed by order of the Committee all last week, and there is no indication at present forthcoming which might justify a forecast of when it may be expected to reopen. It can, however, be taken as a matter of certainty that the Committee will proceed with the utmost circumspection, and will not issue the order until they feel amply assured that the time for safe action has arrived. The position is one of extreme difficulty. On the one hand, there are the obvious inconveniences and losses of those to whom it is their living caused by the abrupt and prolonged arrestation of business, while, on the other, there is the danger of a premature reopening bringing about a recrudescence of the state of affairs which imposed the necessity of authoritative closure on July 31. This would almost inevitably produce a situation worse than before; for there are transactions of enormous magnitude awaiting settlement. This dark possibility is present to the minds of many, who do not hesitate to advocate the cancellation of all engagements entered into for the mid-August account. The problem before the Committee is, therefore, one demanding the most painful deliberation. In the meanwhile, there have been dealings in securities outside the Exchange (though we understand it is not considered desirable for this sort of business to attain any undue proportions), and Consols have changed hands at about 69½ to 70, which was the official quotation at the close of business on July 30. There have also been dealings in some other securities which bulk somewhat largely in the public view in ordinary times; but as the prices were matters of private bargaining, they command no authority.

For continuity of record, we reprint our last Official Quotations List, varied only in respect of recent capital issues.

OFFICIAL QUOTATIONS AT THE CLOSE OF THE WEEK.

Bank Rate (fixed Aug. 8), 5 per cent. Last year, 4½ per cent. Consols, —. Previous week, —.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	April 8	2½	Alliance & Dublin Ord.	59–64	..	3 18 2
374,000	,,	July 10	4	Do. 4 p.c. Deb.	76–79	..	5 1 3
280,000	5	April 29	7½	Bombay, Ltd.	5⅞–6⅞	..	5 17 8
50,000	10	Feb. 26	16	Bourne-mouth Gas and Water Pref. 10 p.c.	29–30	..	5 6 8
373,480	10	,,	7	Do. B 7 p.c.	15–15½	..	4 10 4
95,000	10	,,	6				
330,000	Stk.	Feb. 26	14	Brentford Consolidated	261–266	..	5 5 3
330,000	,,	,,	11	Do. New	204–209	..	5 5 3
50,000	,,	,,	5	Do. 5 p.c. Pref.	109–111	..	4 10 1
206,250	,,	June 11	4	Do. 4 p.c. Deb.	91–93	..	4 6 0
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	208–213	..	5 3 4
244,200	,,	,,	8	Do. A Ord. Stk.	154–159	..	5 0 8
530,000	20	Mar. 26	12½	British	44–45	..	5 11 1
120,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88–90	..	4 8 11
245,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb.	85–87	..	4 12 0
100,000	10	—	—	Cape Town & Dis., Ltd.	1½–2½	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	4–6	..	—
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	70–75	..	6 0 0
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord.	108–110	..	4 10 11
1,513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106–108	..	5 1 3
560,000	,,	,,	6½	Do. 3½ p.c. do.	103–105	..	5 1 6
475,000	,,	June 11	8	Do. 3 p.c. Deb. Stk.	69½–71½	..	4 3 11
800 000	Stk.	,,	4	Continental Union, Ltd.	76–79	..	5 1 3
200 000	,,	,,	7	Do. 7 p.c. Pref.	115–118	..	5 18 8
492,270	Stk.	—	6	Derby Con. Stk.	123–125	..	4 16 0
55,000	,,	—	4	Do. Deb. Stk.	102–104	..	3 16 11
1,002,180	10	July 29	10	European, Ltd.	17⅛–18*	..	5 11 1
16,362,910	Stk.	Feb. 12	4/17/4	Gas Light and Coke 4 p.c. Ord.	98–102	..	4 15 6
2,600,000	,,	,,	3½	3½ p.c. max.	76–79	..	4 8 7
4,062,235	,,	,,	4	4 p.c. Con. Pref.	96–99	..	4 0 10
4,674,850	,,	June 11	3	3 p.c. Con. Deb.	72¼–74½	..	4 0 6
258,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87–89	..	5 12 4
70,000	10	April 29	11	Hongkong & China, Ltd.	16¼–16⅝	..	6 11 4
131,000	Stk.	Mar. 12	7⅜	Ilford A and C	151–154	..	4 19 0
65,780	,,	,,	6⅛	Do. B	115–118	..	5 3 10
65,500	,,	June 26	4	Do. 4 p.c. Deb.	92–94	..	4 5 1
4,940,000	Stk.	May 14	9	Imperial Continental	150–160	..	5 12 6
1,235,000	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	84–86	..	4 1 5
200,242	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c.	119–121	..	5 7 5
561,000	Stk.	Feb. 26	10	Liverpool United A	211–213	..	4 13 11
718,100	,,	,,	7	Do. B	146–148	..	4 14 7
306,083	,,	June 26	4	Do. Deb. Stk.	97–99	..	4 0 10

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
75,000	5	June 11	6	Malta & Mediterranean	4⅛–4⅜	..	6 9 9
250,000	100	April 1	4½	Met. of Melbourne 4½ p.c. Deb.	99–101	..	4 9 1
541,920	20	May 28	4	Monte Video, Ltd.	11½–12	..	6 13 4
1,775,892	Stk.	July 29	4½	Newc'tle&G'tesh'd Con.	98½–99½	..	4 10 6
529,705	Stk.	June 26	3½	Do. 3½ p.c. Deb.	£2–83	..	4 4 10
55,940	10	Feb. 26	7/14/0	North Middlesex 7 p.c.	14–15	..	5 2 8
300,000	Stk.	May 14	8	Oriental, Ltd.	117–122	..	6 11 2
60,000	5	Mar. 26	10	Ottoman, Ltd.	7⅛–7⅜	..	6 9 0
60,000	50	Feb. 26	18	Portsea, Island B	128–131	..	4 19 3
100,000	50	,,	12	Do. C	118–121	..	4 19 2
249,980	5	April 29	8	Primitiva Ord.	5⅛–6	..	6 18 4
499,960	5	June 26	5	,, 5 p.c. Pref.	4⅜–5	..	5 0 0
521,600	100	June 2	4	,, 4 p.c. Deb.	91–93	..	4 6 0
346,198	Stk.	June 26	4	River Plate 4 p.c. Deb.	85–87	..	4 12 0
150,000	10	May 14	6	San Paulo 6 p.c. Pref.	10½–11	..	5 9 1
125,000	50	July 1	5	San Paulo 5 p.c. Deb.	47–49	..	5 2 0
135,000	Stk.	Mar. 12	10	Sheffield A	223–224	..	4 9 3
209,984	,,	,,	10	Do. B	222–224	..	4 9 3
623,500	,,	,,	10	Do. C	220–222	..	4 10 1
90,000	10	May 28	9	South African	10½–11½	..	7 16 6
6,429,895	Stk.	Feb. 12	5/9/4	South Met., 4 p.c. Ord.	111–113	..	4 16 8
1,295,445	,,	July 10	3	Do. 3 p.c. Deb.	72½–74½	..	4 0 6
309,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	157–159	..	5 6 11
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114–116	..	5 3 5
60,000	,,	,,	5	Do. 5 p.c. Pref.	110–112	..	4 9 3
137,058	,,	June 26	5	Do. 5 p.c. Deb. Stk.	116–118	..	4 4 9
629,740	Stk.	May 14	5	Southampton Ord.	99–102	..	4 18 0
120,000	Stk.	Feb. 12	7½†	Tottenham District A 5 p.c.	135–138	..	5 8 8
742,275	,,	,,	6†	B 3½ p.c.	115–117	..	5 2 7
181,255	,,	June 26	4	4 p.c. Deb.	87–89	..	4 9 11
182,380	10	Dec. 30	5	Tuscan, Ltd.	5–6	..	8 6 8
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	93–95	..	5 5 3
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	108½–109½	..	4 11 4
				Wandsworth, Wimbledon, and Epsom—			
30,000	Stk.	Feb. 26	8⅜	Wandsworth A 5 p.c.	151–156	..	5 7 4
255,636	,,	,,	6⅝	,, B 3½ p.c.	129–134	..	5 2 7
108,075	,,	,,	5/17/3	,, C 3½ p.c.	110–115	..	5 2 0
352,000	,,	,,	6½	Wimbledon 5 p.c.	117–122	..	5 0 5
98,000	,,	,,	6⅜	Epsom 5 p.c.	121–126	..	5 5 2
88,416	,,	June 26	3	3 p.c. Deb. Stk.	66–69	..	4 6 11

Prices marked * are "Ex Div." † Next Dividend will be at this rate.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments Vacant.

LIGHTING FOREMAN. Royal Borough of Kensington. Applications by Sept. 7.

WORKS FOREMAN. Saffron Walden Gas Department. Applications by Aug. 7.

RENTAL CLERK (WATER AND GAS). Bexhill Water and Gas Company.

STOKER, FITTER, MAIN AND SERVICE LAYER, &c. No. 5925.

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"D. G.," c/o Scripps's Advertising Offices.

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MORECAMBE GAS DEPARTMENT.

Coal.

STRATFORD-ON-AVON GAS DEPARTMENT. Tenders by Aug. 29.

Compressors.

SALFORD GAS DEPARTMENT. Tenders by Sept. 9.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
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